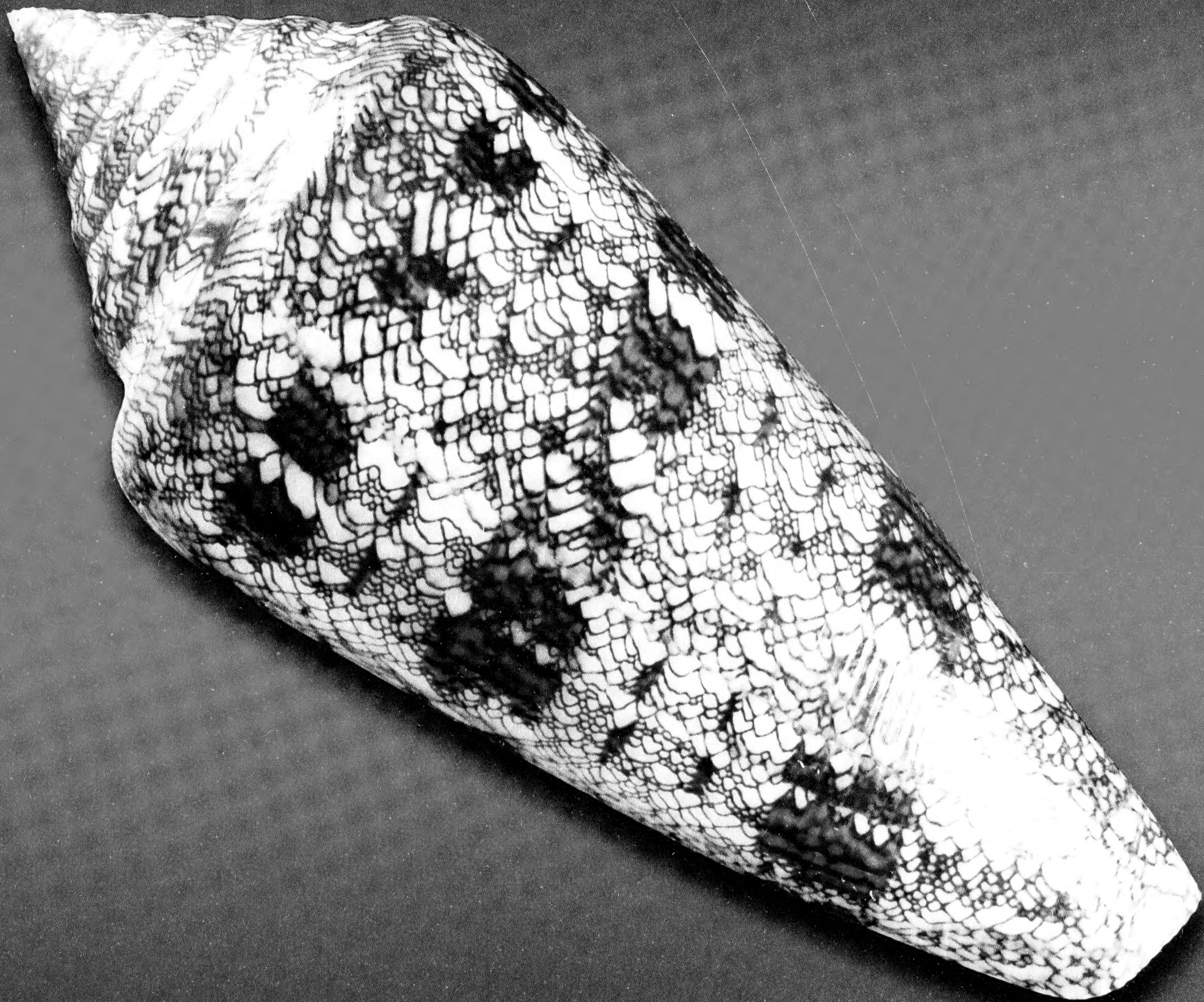


THE Festivus

Vol. 54(4)

November 2022

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Another Sundaland relict cone

Fossil *Jenneria* from Florida

New *Laevistrombus* species

***Amphidromus* and more**

Quarterly Publication of the San Diego Shell Club



THE FESTIVUS

A publication of the San Diego Shell Club

Volume: 54

November 2022

ISSUE 4

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FRONT COVER:

Cylinder feliciae Berschauer & Petuch, 2022, holotype, from Sumbawa Island, Indonesia. (Photo courtesy of David P. Berschauer) (Cover artistic credit: Rex Stilwill).

MISSION STATEMENT

The San Diego Shell Club was founded in 1961 as a non-profit organization for educational and scientific purposes. More particularly to enjoy, study and promote the conservation of Mollusca and associated marine life through lectures, club meetings and field trips. Our membership is diverse and includes beginning collectors, scientists, divers, underwater photographers and dealers.

THE FESTIVUS is the official quarterly publication of the San Diego Shell Club, Inc. and is issued as part of membership dues in February, May, August and November. *The Festivus* publishes articles that are peer reviewed by our volunteer Scientific Peer Review Board, as well as articles of general interest to malacologists, conchologists, and shell collectors of every level. Members of the Peer Review Board are selected to review individual articles based upon their chosen field of expertise and preference. Available by request or on our website are:

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Another Sundaland Relict *Cylinder* Species from Sumbawa Island, Indonesia

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ABSTRACT A new cone species, *Cylinder feliciae*, is described from the Saleh Gulf (Teluk Saleh) of Sumbawa, Nusa Tenggara Islands (Lesser Sunda Islands), Indonesia. The new species is morphologically similar to *Cylinder gloriamaris* (Chemnitz, 1777) from the southwestern Pacific and represents a geographically-isolated relict of a once widespread molluscan fauna that extended all along the coast of the Middle Pleistocene Sundaland Peninsula.

KEY WORDS Conidae, *Cylinder*, Indonesia, Lesser Sunda Islands, Sumbawa, Teluk Saleh

INTRODUCTION

The northern Lesser Sunda Islands of Indonesia, extending from Lombok Island to the Wetar Islands, constitute an “evolutionary hot spot” referred to as the Nusa Tenggara Infraprovince (Petuch and Berschauer, 2020: 190-191). This special area of increased speciation and evolution is one of the centers of biodiversity within the Indonesian Subprovince of the Indo-Malayan Molluscan Province and houses a large number of highly-restricted endemic species (Petuch and Berschauer, 2020: 203). Some of these Nusa Tenggara endemics include the cowrie *Erronea vredenburgi* Schilder, 1927, the volute *Cymbiola chrysostoma* (Swainson, 1824), and the cones *Cylinder johnabbasi* Petuch & Berschauer, 2018, *Cylinder sumbawaensis* Verbinnen, 2022, *Phasmoconus giorossii* (Bozzetti, 2006), *Graphiconus wittigi* (Walls, 1977), and several closely-knit sibling taxa in the *Eugeniconus victor* (Broderip, 1842) species complex (Parsons *et al.*, 2020). (See Plate 3)

Recently, increased collecting and exploration on Sumbawa Island, at the western end of the archipelago, has resulted in the discovery of two

unusual new conids: *Cylinder sumbawaensis* Verbinnen, 2022, and the species described herein. As pointed out by Veldsman *et al.* (2022) the enclosed and sheltered Teluk Saleh of Sumbawa Island has acted as a biogeographical refugium and contains a relict pocket of a Pleistocene Sundalandian marine environment, analogous to the relict pockets found in the Caribbean Sea (Petuch, 1982; Petuch, 2013). (See Figures 1 and 2) Here, a remnant of an ancestral Sundalandian molluscan fauna, including a *Cylinder* species complex has managed to survive.

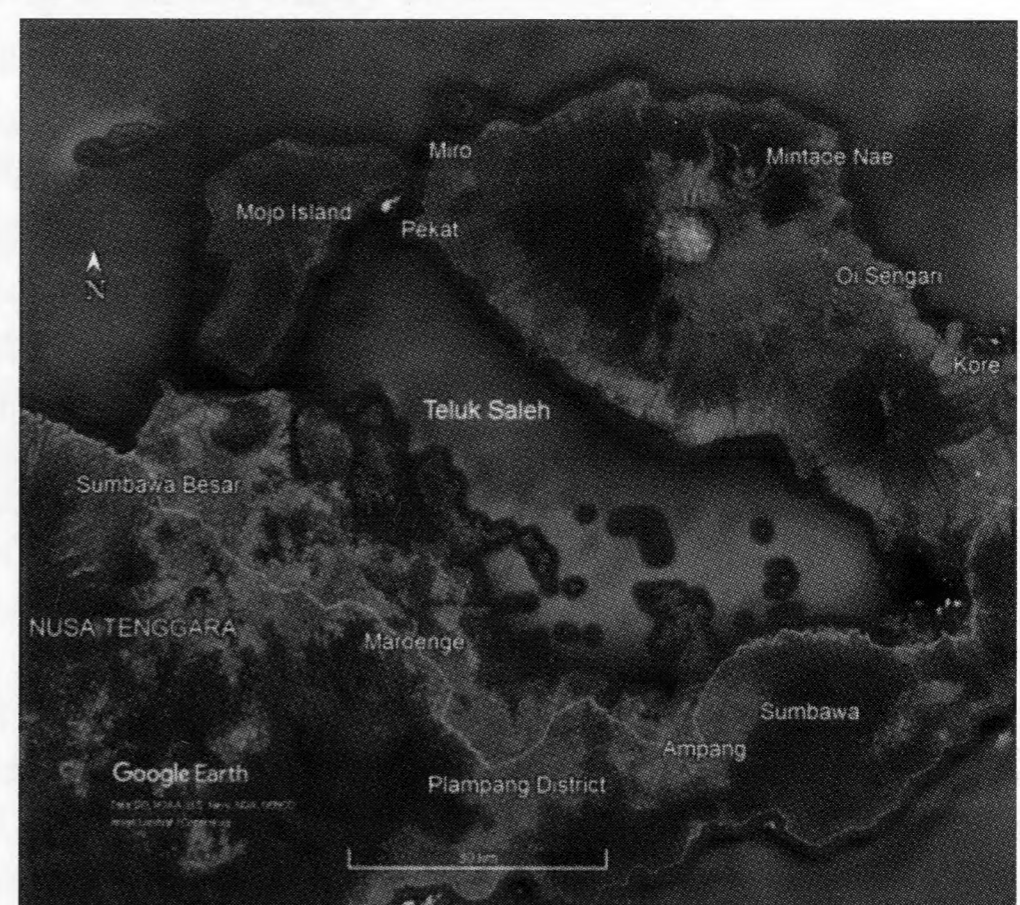


Figure 1. Satellite map of Teluk Saleh, Sumbawa Island. (Google Earth Image, 2019)

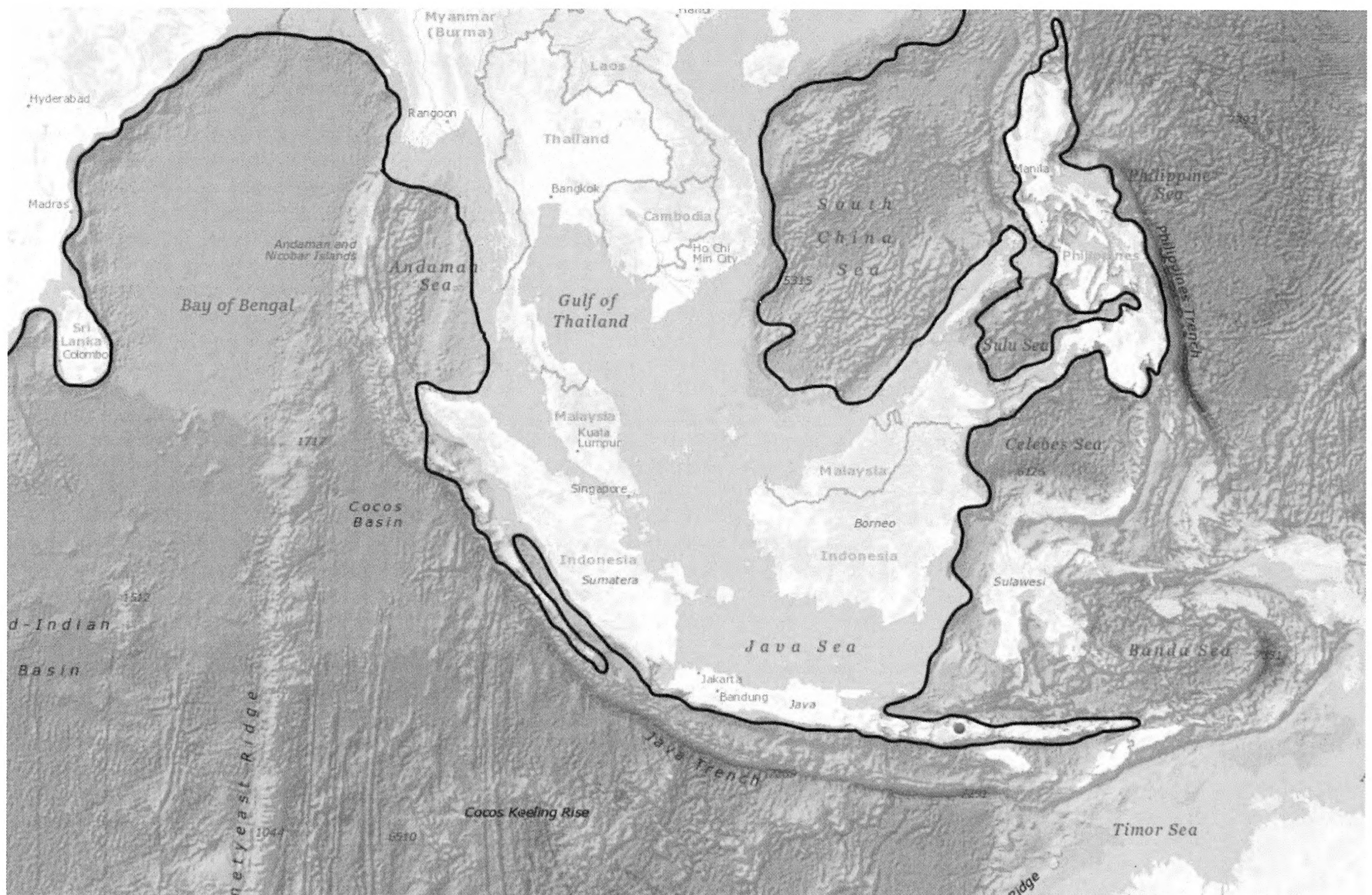


Figure 2. Middle Pleistocene coastlines of Sundaland compared to present day. (Adapted from Wisnu-Aji, 2016, and Zahirovic *et al.* 2014.) The red dot shows the modern day location of Teluk Saleh, Sumbawa Island, Indonesia.

SYSTEMATICS

Phylum Mollusca

Class Gastropoda

Subclass Sorbeoconcha

Order Prosobranchia

Infraorder Neogastropoda

Superfamily Conoidea

Family Conidae

Subfamily Coninae

Genus *Cylinder* Montfort, 1810

Cylinder feliciae Berschauer and Petuch,
new species
(Plate 1, Figures A-D)

Description. Shell of average size for genus, cylindrical, with straight very slightly convex sides; spire height moderate and stepped;

shoulder broad, angulate but slightly rounded; whorl tops slightly concave, shiny, bearing five fine radial line; protoconch and early whorls pink in color; aperture proportionally wide, pale whitish-blue within; body whorl smooth and shiny, with silky texture; body whorl cream-tan colored, completely overlaid with a dense dark brown fine netted pattern, composed of interconnected small triangles, ovals, and amorphous nettings that extend for entire length of shell; three wide bands of dark brown patches extend around body whorl, arranged with one at the mid-body line, one around the top third below the shoulder, and one around the basal third; underlying body color includes a gray-blue hue on the shoulder and whorl tops and gray-blue axial streaks; bearing one or two rows of long dark brown dashes located mid point between the wide bands of dark brown patches.

Type Material. Holotype LACM 3797 measuring 80.11 mm in height, 32.23 mm in width. Other material examined: two specimens in the Berschauer collection measuring 73.25 mm in height, 29.25 mm in width, and 59.07 mm in height, 22.60 mm in width; one specimen in the Petuch collection measuring 60.19 mm in height and 23.86 mm in width.

Type Locality. Teluk Saleh, Sumbawa Island, West Nusa Tenggara Province, Indonesia, in 10-15 meters depth. Collected by fishermen using hookah apparatus, diving for lobsters.

Distribution. Only known from Teluk Saleh, Sumbawa Island, Indonesia.

Etymology. Named for Felicia Berschauer, wife of the senior author.

DISCUSSION

Cylinder feliciae is another recently-discovered endemic species from the Nusa Tenggara Infraprovince, an area of increased speciation and evolution in the Indonesian Subprovince of the Indo-Malayan Molluscan Province. (Petuch and Berschauer, 2020: 190-191; Veldsman *et al.*, 2022). The new species is closest morphologically to its well-known sister taxon, *Cylinder gloriamaris* (Chemnitz, 1777), which has a widespread distribution throughout the Philippines Archipelago (the Philippinian Subprovince), with reports of specimens also being found in Papua New Guinea, the Solomon Islands, Fiji, and Samoa (the Melanesian Subprovince) (Rockel *et al.*, 1995; Monnier *et al.*, 2018) (holotype of *C. gloriamaris*, Plate 2, Figures E-F). The localities of the two populations are biogeographically far apart, with no direct gene flow. *Cylinder feliciae* is proportionately stockier than *C. gloriamaris* with a broader shoulder relative to length, an

angled shoulder, and a less dense and substantially darker color pattern of small triangles, ovals and netting on the body whorl, and long dark brown dashes.

ACKNOWLEDGEMENTS

The authors thank Feri Fajriyanto for acquiring the type lot from the fishermen on Sumbawa Island, and the anonymous reviewers.

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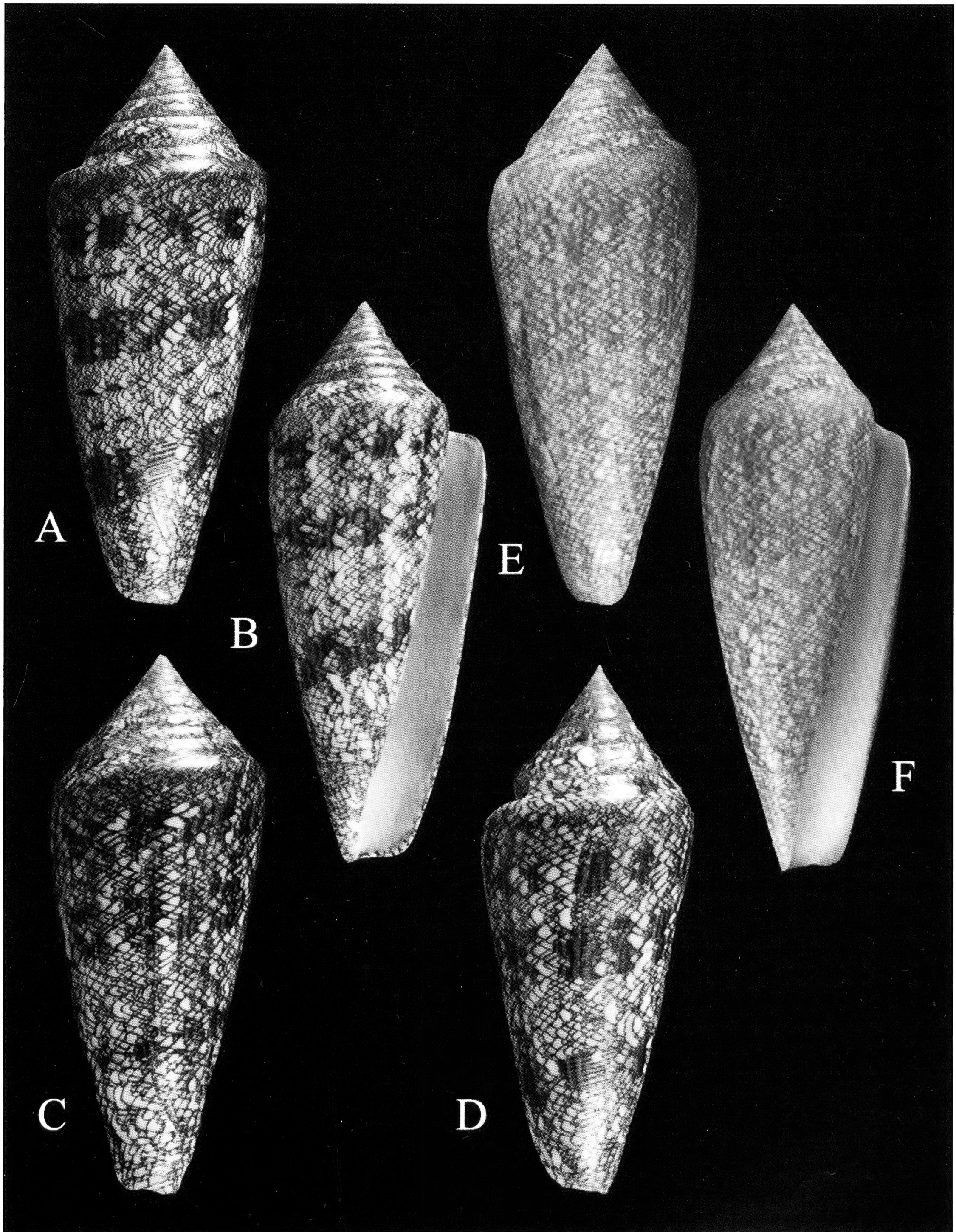


Plate 1. *Cylindrella feliciae* compared with *C. gloriamaris*.

A, B= *Cylindrella feliciae* holotype, LACM 3797, measuring 80.11 mm in height, 32.23 mm in width; **C**= *C. feliciae* specimen in the Berschauer collection measuring 73.25 mm in height, 29.25 mm in width; **D**= *C. feliciae* specimen in the Petuch collection measuring 60.19 mm in height and 23.86 mm in width; **E, F**= *C. gloriamaris* (Chemnitz, 1777) holotype, Universitetets Zoologiske Museum, Copenhagen (UZMC), measuring 92 mm in height, 35 mm in width.

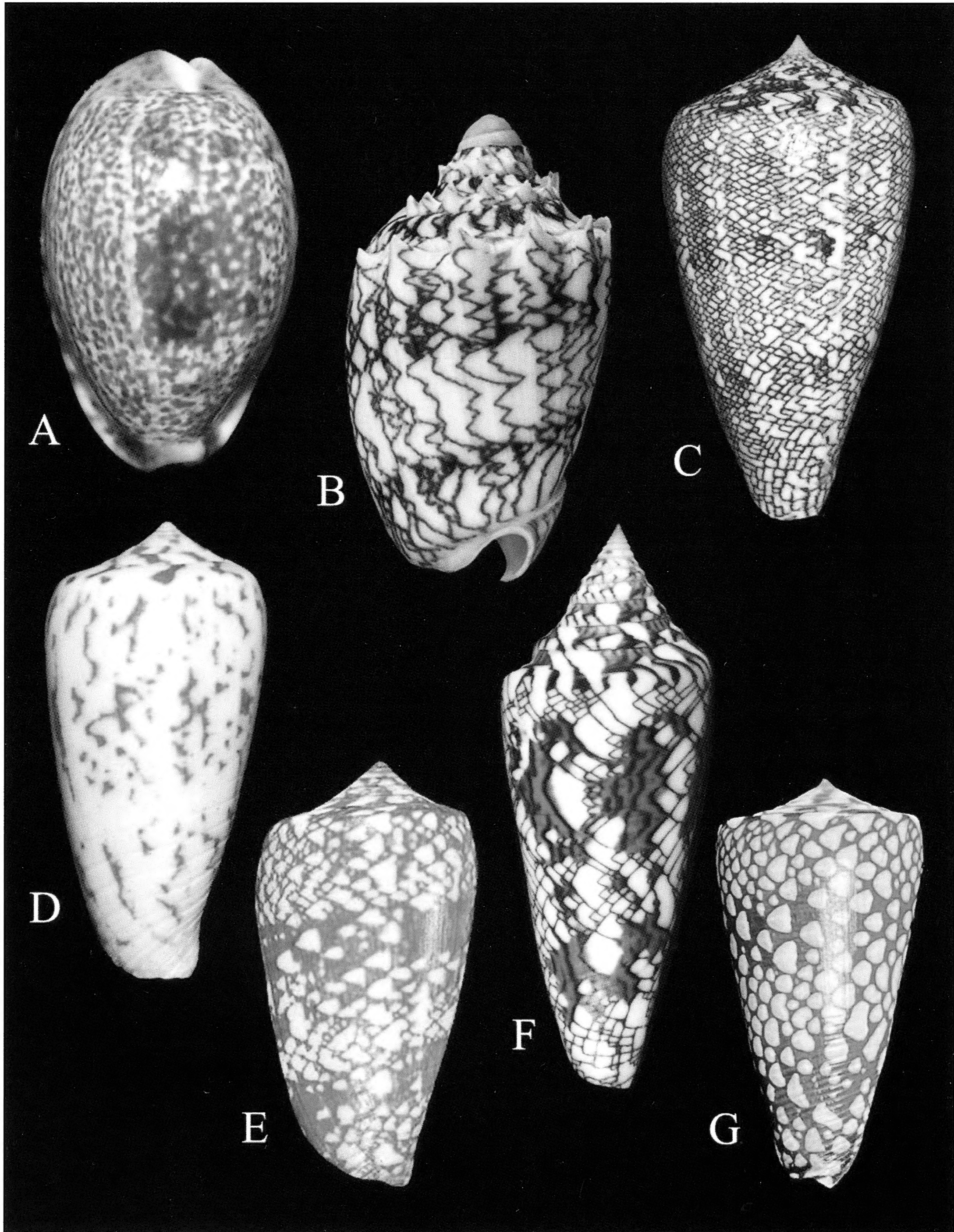


Plate 2. Some Nusa Tenggara Endemic Species.

A= *Erronea vredenburgi* Schilder, 1927, measuring 25 mm in length; **B**= *Cymbiola chrysostoma* (Swainson, 1824), measuring 47 mm in length; **C**= *Cylindrella johnabbasi* Petuch & Berschauer, 2018, measuring 73 mm in length; **D**= *Phasmoconus giorossii* (Bozzetti, 2006), measuring 32 mm in length; **E**= *Graphiconus wittigi* (Walls, 1977), measuring 31 mm in length; **F**= *Cylindrella sumbawaensis* Verbinnen, 2022, measuring 68.5 mm in length; **G**= *Eugeniconus gisellelieae* Parsons, Abbas & Lie, 2020, measuring 40.11 mm in length.

Four New Cone Shells from Northern and Central Brazil

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ABSTRACT Four new cone shells are described from the Brazilian Molluscan Province. These include: *Jaspidiconus tibauensis* new species, from the Cearaian Subprovince of northern Brazil; and three species from the Bahian Subprovince of central Brazil, including *Jaspidiconus barragrandensis* new species, *Dauciconus luizcouthi* new species, and *Poremskiconus guarapari* new species.

KEY WORDS Conidae, *Jaspidiconus*, *Dauciconus*, *Poremskiconus*, Brazil, Rio Grande do Norte State, Bahia State, Espirito Santo State, Brazilian Molluscan Province, Cearaian Subprovince, Bahian Subprovince

INTRODUCTION

Recent research into the composition and distribution of molluscan faunas found along the coasts of Brazil has shown that the biodiversity of the family Conidae is much higher than previously thought (Petuch, 2013; Petuch and Berschauer, 2020). Within the Brazilian Molluscan Province (Amazon River Mouth south to Cabo Frio, Rio de Janeiro State; Petuch and Berschauer, 2020), the Cearaian Subprovince of northern Brazil and the Bahian Subprovince of central Brazil were both found to contain extremely rich endemic cone shell faunas, containing many species that were previously unnamed and undescribed. Characteristically, many of these unnamed taxa were found to be geographically highly-restricted, often being found on one island, one reef area, or one small stretch of coastline. For illustrated reviews of the Brazilian cone shell faunas and their biodiversity, see Petuch, 2013;

Petuch and Berschauer, 2020; and Petuch and Myers, 2014.

In response to the increased interest in Brazilian malacology that resulted from these numerous recent discoveries, we have formed a group of active amateur malacologists who are devoted to intensive field work and research of the unexplored areas of the Brazilian Province. As “citizen scientists” we have devoted our spare time to diving on previously unexplored coral and coralline algal reefs, to investigating isolated intertidal areas, and to working with local fishermen to secure deep water specimens. These endeavors have yielded a large number of new and interesting gastropods, including important additions to the known Brazilian cone shell fauna. Four of these new species are described in the following sections. The holotypes of the new taxa are deposited in the type collection of the Zoological Museum of the University of São Paulo, São Paulo, Brazil, and bear MZSP catalog numbers.

SYSTEMATICS

Class Gastropoda

Subclass Sorbeoconcha

Order Prosobranchia

Infraorder Neogastropoda

Superfamily Conoidea

Family Conidae

Subfamily Conilithinae

Genus *Jaspidiconus* Petuch, 2004

Jaspidiconus barragrandensis Crabos,
Pomponet, Pereira, and Passos new species
(Plate 1, Figures A, B)

Description. Shell of average size for genus, fusiform, with straight sides, polished and smooth; shoulder sharp and carinate; spire elevated, slightly stepped, with slightly canaliculated whorls; body whorl ornamented with 12-14 incised spiral sulci; shell color beige or pale tan overlaid with amorphous larger dark tan patches and numerous rows of small, thin, dashes; shoulder carina edged with 16-20 large brown, evenly-spaced spots; aperture narrow, pale tan on interior.

Type Material. HOLOTYPE- length 20.4 mm, width 10.5 mm, from Barra Grande Bahia State, Brazil, MZSP 157112.

Type Locality. Found dead at low tide, Barra Grande, Camamu Bay, 150 km south of Salvador, Bahia State, Brazil.

Distribution. The new species is known to range from Morro de São Paulo on Tinhare Island to Boca do Rio Beach, Boipeda Island, and south to Barra Brande, southern Bahia State, Brazil.

Etymology. Named for the type locality, Barra Grande, Bahia State, Brazil.

Discussion. This new Bahian Subprovince cone is most similar to *Jaspidiconus marinae* Petuch and Myers, 2014 (Figure 1 C, D) from Itaparica Island, Salvador, Bahia State, but differs in being a larger, less-inflated shell with straighter sides. It is also a less-colorful shell, exhibiting mostly pale tans and beiges, and never having the intense purple and pink colors seen on the Itaparican species. Characteristically, *Jaspidiconus barragrandensis* also has more numerous and proportionally-smaller spots on the shoulder carina.

Jaspidiconus tibauensis Crabos, Pomponet,
Pereira, and Passos new species
(Plate 1, Figures E, F)

Description. Shell of average size for genus, stocky, rotund, inflated, with rounded sides; shoulder rounded, slightly angled; spire subpyramidal with slightly stepped whorls; shoulder edge with 16-18 low, rounded knobs; body whorl ornamented with 16-18 rows of proportionally large, rounded pustules; rows of pustules separated by incised shallow groove; color pale pinkish-white overlaid with very large, prominent, amorphous pinkish-tan patches; edge of shoulder with widely-separated small reddish-brown narrow flammules; aperture proportionally-wide, white within interior.

Type Material. HOLOTYPE- length 16.9 mm, width 9.9 mm, from Tibau, Rio Grande do Norte State, Brazil, MZSP 157115. PARATYPES- length 15 mm, from Tibau, in the Olivier Crabos Collection; length 18 mm, from Icapui, Ceara State, Brazil, in the Gregorio Pereira de Queiroz Collection; length 18.4 mm, from Tibau, in the Geraldo Pomponet Collection.

Type Locality. Collected on coralline algal rubble and carbonate sand, 30-40 m depth off Tibau, Rio Grande do Norte State, Brazil.

Distribution. The new species ranges from Tibau, Rio Grande do Norte State to Icapui, Ceara State Brazil. It has also been dredged from 70 m depth on the offshore Canopus Bank.

Etymology. Named for the town of Tibau, Rio Grande do Norte State, near the border of Ceara State, northeastern Brazil.

Discussion. This distinctive Brazilian Province *Jaspidiconus* species is the newest member of a complex of heavily-pustulated cones that ranges all along northern Brazil. Of these, *J. tibauensis* is most similar to *J. damasomonteiroi* from Camocim, Ceara State (Figure 1 G, H), but differs in being a much more inflated and rotund species that is noticeably less-elongated. The pustules on *J. damasomonteiroi* are also proportionally much larger and more prominent than those seen on *J. tibauensis*, especially those along the edge of the shoulder. The new species is also similar to the sympatric *J. toincabrali* Petuch and Berschauer, 2019, also found at Tibau, but differs in having less-prominent and more subdued pustules on the body whorl, in having more rounded and lower knobs on the edge of the shoulder, and in having a much more colorful shell with a pink base color and with very large and conspicuous brown flammules and patches. The more ornate and more heavily-pustulated *J. toincabrali* consistently has a pure white shell that lacks any traces of color on the body whorl or spire.

Subfamily Puncticulinae

Genus *Dauciconus* Cotton, 1945

Dauciconus luizcoutoi Crabos, Pomponet, Pereira, and Passos new species
(Plate 2, Figures A, B)

Description. Shell of average size for genus, very elongated and attenuated, with straight sides and low, almost flattened spire; shoulder angled with slightly rounded, subcarinate edge; spire whorls slightly canaliculated; body whorl smooth and polished; shell base color pale pinkish-white overlaid with dense network of longitudinally-arranged brown flammules and 2 broad bands of orange-tan color and one white band, with orange-tan bands being anterior and posterior to white central band; spire whorls white with numerous evenly-spaced dark reddish-brown, crescent-shaped flammules; protoconch pink; aperture uniformly narrow, colored deep pink inside.

Type Material. HOLOTYPE- length 58.1 mm, width 29.3 mm, from off Coroa de Barra Seca, Linhares, Espirito Santo State, Brazil, MZSP 157116.

Type Locality. Collected by octopus fishermen, from 60 m depth off Coroa de Barra Seca, Linhares, Espirito Santo State, Brazil.

Distribution. The new species is known only from the type locality off Linhares, Espirito Santo State, Brazil. At 60 m depth, the new species occurs together with the smaller cone, *Poremskiconus archetypus* (Crosse, 1865).

Etymology. Named for Luiz Couto of Guarapari, Espirito Santo State (Mar a Mar Company), who brought this outstanding shell to our attention.

Discussion. Although known from a single specimen from the Ilhas Rasas, this new species is so distinctive that we felt confident describing it and giving it a name. Of the Bahian Subprovince *Dauciconus* species, *D. luizcoutoi* is similar only to *D. riosi* (Petuch, 1986) (Figure 2 C, D), but differs in being a proportionally more narrow and elongated shell with a lower spire. Although a colorful species, *D. riosi* usually exhibits wide bands of bright orange or orange-tan color and never has the pinkish-white base color or dense network of brown longitudinal flammules that characterize *D. luizcoutoi*. The bright pink color of the interior of the aperture is unique to the new species and is not seen in any other Brazilian cone shell.

Genus *Poremskiconus* Petuch, 2013

Poremskiconus guarapari Crabos, Pomponet, Pereira, and Passos new species
(Plate 2, Figures E, F)

Description. Species of average size for genus, stocky, truncated, broad across the shoulder; spire proportionally low, subpyramidal; shoulder angled, subcarinated, ornamented with conspicuous low, knob-like undulations; body whorl polished and shiny, colored uniform dark orange-brown, with single narrow band of white around mid-body; white central band marked with small brown flammules; spire white, marked with large, prominent, evenly-spaced flammules of darker orange-tan color; undulating shoulder carina marked with evenly-spaced small dark tan flammules; aperture uniformly narrow, white within; protoconch and early whorls orange-tan.

Type Material. HOLOTYPE- length 22.5 mm, width 12.7 mm, from Ilhas Rasas, Guarapari, Espirito Santo State, Brazil, MZSP 157113. PARATYPES- 2 specimens, lengths 25 mm and 28 mm, from Ilhas Rasas, in the Olivier Crabos

Collection; length 24 mm, in the Geraldo Pomponet Collection.

Type Locality. Collected in 8m to 20 m depths off the Ilhas Rasas, 3 km off Guarapari, Espirito Santo State, Brazil.

Distribution. Known only from the Ilhas Rasas off Guarapari, Espirito Santo State, Brazil.

Etymology. Named for the city of Guarapari, Espirito Santo State, Brazil. The city was named after a type of spear used by the local Native Americans to hunt Scarlet Ibis.

Discussion. *Poremskiconus guarapari* is the newest member of a large and characteristic species complex of Brazilian cones, containing at least 12 species (see Petuch and Berschauer, 2020). Although three species are known from the southern Caribbean Sea (Panama, Colombia, and the Grenadines), the majority of the known *Poremskiconus* species occur only in the Brazilian Province and can be considered one of the primary biogeographical index genera for the Province and its subprovinces. Of all the species within this tight-knit complex, the new Rasas Islands (Ilhas Rasas) endemic is most similar to *P. abrolhosensis* (Petuch, 1987) from the coast of Bahia State, including the Abrolhos Islands and Abrolhos Platform, and south to Espirito Santo State (Figure 2 G, H). *Poremskiconus guarapari* differs from its congener in being a far less colorful shell, lacking the bright red and orange colors seen on *P. abrolhosensis*, and instead having a uniform orange-tan shell color. The Abrolhos cone also differs in often having rows of fine orange-brown dots encircling the body whorl (like the specimen shown here) and in having white spire whorls that are marked with very large, prominent, evenly-spaced dark brown flammules. See Petuch and Berschauer, 2020 for an illustrated overview of the genus

Poremskiconus in the Brazilian Province, including endemic species from the Abrolhos Platform.

ACKNOWLEDGMENTS

We thank the following for their invaluable help in assembling the information that comprises this paper: Sergio Vanin for his conservative approach to Brazilian molluscan systematics; Alfredo Bodart for calling our attention to *Poremskiconus guarapari*; Dr. Luiz Simone (Zoological Museum of the University of São Paulo) for taking the excellent photos and for technical assistance; Dr. Edward J. Petuch (Department of Geosciences, Florida Atlantic University) for helping with conid systematics and for advise on English grammar; and David P. Berschauer, for assistance with constructing the plates of shell figures and for technical assistance.

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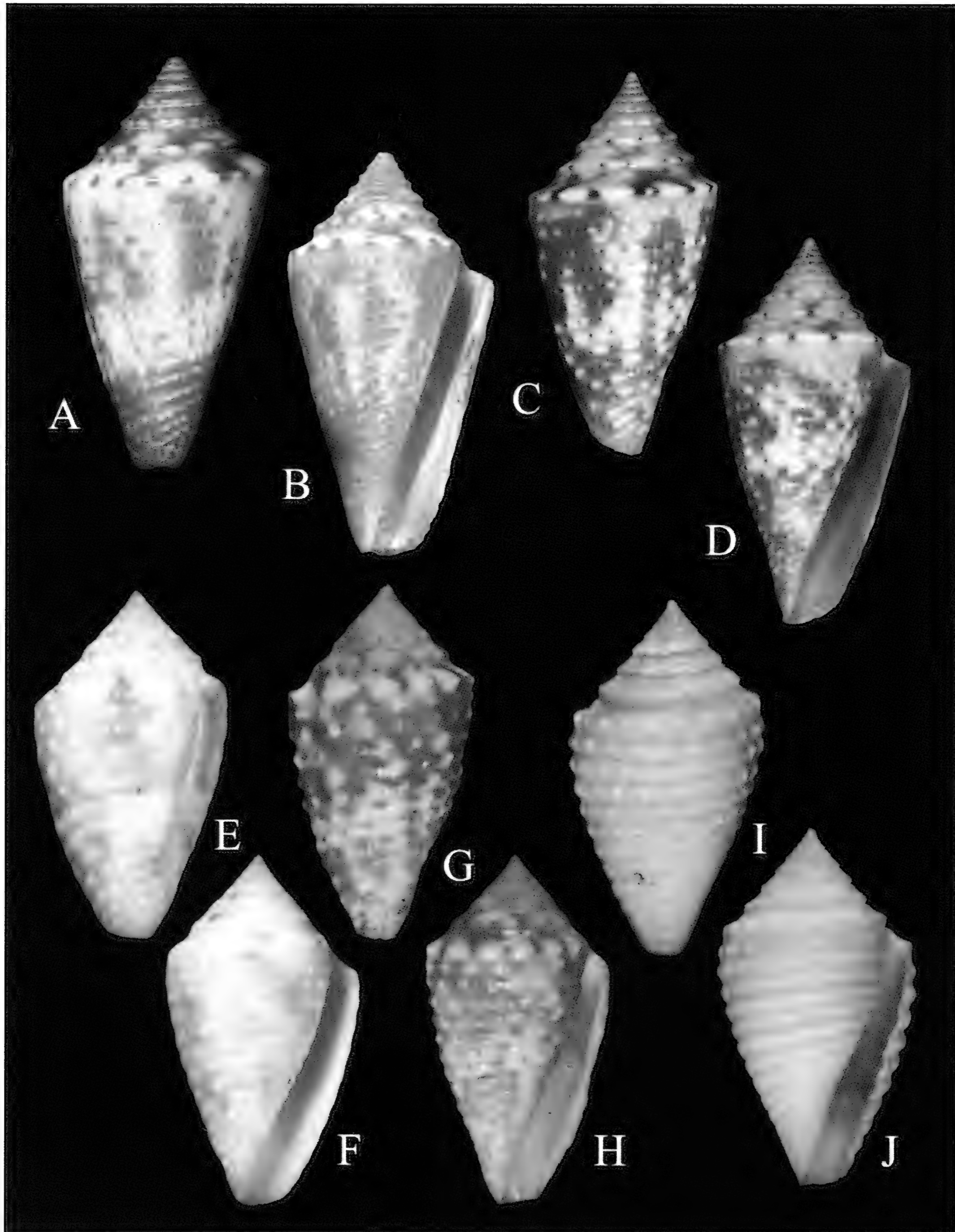


Figure 1. *Jaspidiconus* species from the Bahian and Cearaian Subprovinces of the Brazilian Molluscan Province.

A, B= *Jaspidiconus barragrandensis* Crabos, Pomponet, Pereira, and Passos, new species. Dorsal and ventral views of the 20.4 mm holotype from Barra Grande, Camamu Bay, Bahia State, Brazil, MZSP 157112; **C, D=** *Jaspidiconus marinae* Petuch and Myers, 2014. Dorsal and ventral views of a 20 mm specimen from Itaparica Island, Salvador, Bahia State, Brazil; **E, F=** *Jaspidiconus tibauensis* Crabos, Pomponet, Pereira, and Passos, new species. Dorsal and ventral views of the 16.9 mm holotype from Tibau, Rio Grande do Norte State, Brazil, MZSP 157115; **G, H=** *Jaspidiconus damasomonteiroi* Petuch and Myers, 2014. Dorsal and ventral views of a 15 mm specimen from Camocim, Ceara State, Brazil; **I, J=** *Jaspidiconus toincabrali* Petuch and Berschauer, 2019. Dorsal and ventral views of a 16 mm specimen from Tibau, Rio Grande do Norte State, Brazil.

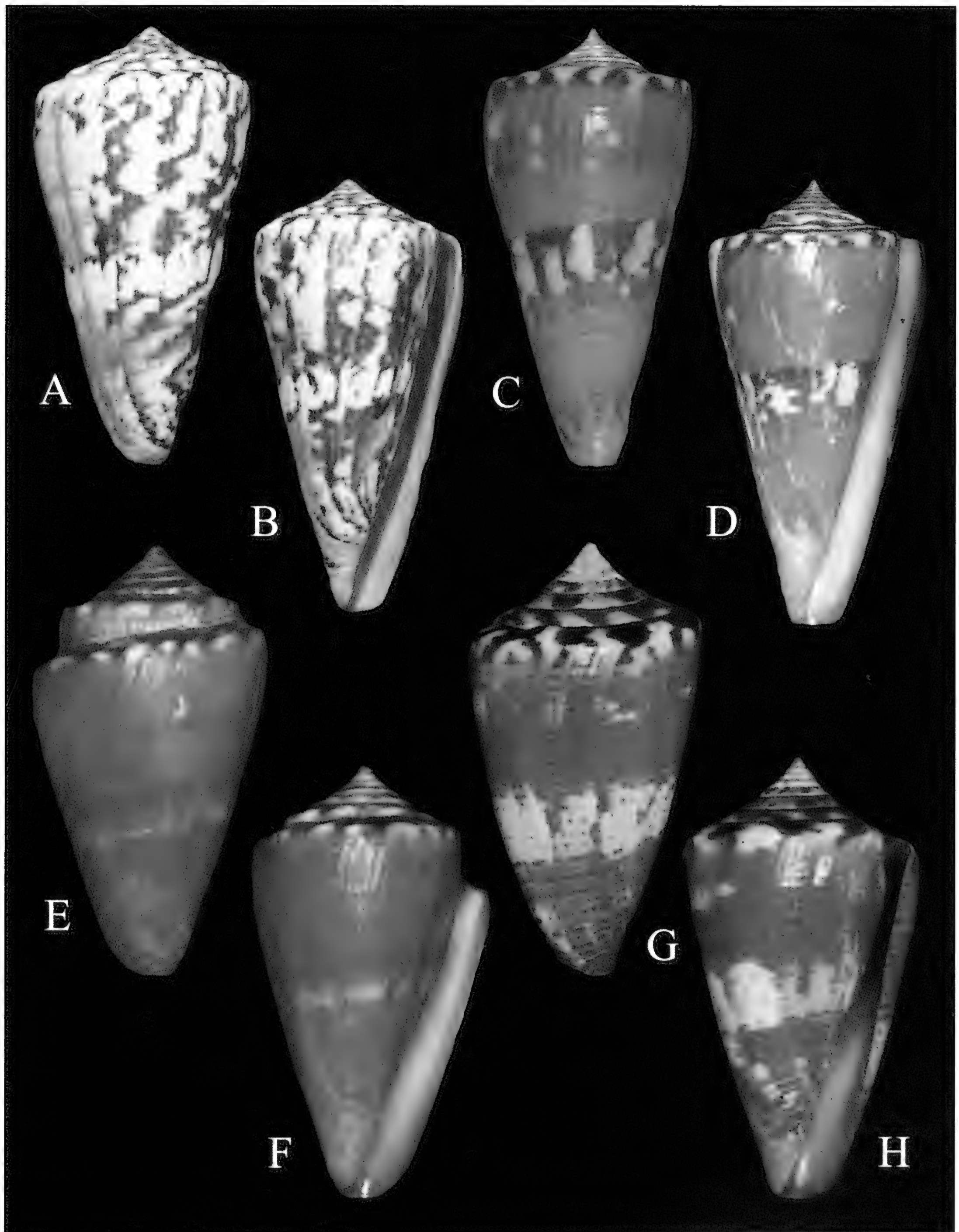


Figure 2. *Dauciconus* and *Poremskiconus* species from the Bahian Subprovince of the Brazilian Molluscan Province.

A, B= *Dauciconus luizcouthi* Crabos, Pomponet, Pereira, and Passos, new species. Dorsal and ventral views of the 58.1 mm holotype from Coroa de Barra Seca, Linhares, Espírito Santo State, Brazil, MZSP 157116; **C, D= *Dauciconus riosi*** (Petuch, 1986). Dorsal and ventral views of a 42 mm specimen from Guarapari, Espírito Santo State, Brazil; **E, F= *Poremskiconus guarapari*** Crabos, Pomponet, Pereira, and Passos new species. Dorsal and ventral views of the 22.5 mm holotype from Ilhas Rasas, Guarapari, Espírito Santo, Brazil; **G, H= *Poremskiconus abrolhosensis*** (Petuch, 1987) (= *P. baiano* Coltro, 2004). Dorsal and ventral views of a 24 mm specimen from off Guarapari, Espírito Santo State, Brazil.

**A New Species of *Jenneria* (Jousseaume, 1884)
from the Belle Glade Member, Bermont Formation of Southern Florida
(Mollusca: Gastropoda: Ovulidae)**

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ABSTRACT The southern Floridian fossil group comprises five *Jenneria* species, including one synonym, plus the newly described species herein, *Jenneria sandrae*. The earliest species is from an uncertain date from the Golden Gate Member of Plio-Pleistocene and the genus ended with the Belle Glade Member, Bermont Formation [Chibanian Age (~750 ka)], Late Middle Pleistocene.

KEY WORDS Ayers Landing, Bee Branch, Belle Glade, Bermont, Coffee Mill Hammock, Caloosahatchee, Capeletti Brothers Pit, *Cypraea*, Dade County, DuBar, Fort Denaud, Fort Thompson, Formation, *Jenneria gabbiana*, Gelasian, Griffin Brothers Pit, Holey Land, *Jenneria hepleri*, *keatonae*, *lindae*, *loxahatchiensis*, Member, Miami Canal, Miami Limestone, Olsson, paciphile, Palm Beach Aggregates Pit, Petuch, Piacenzian Pliocene, Pleistocene, *Jenneria pustulata*, *richardsi*, Rinker Materials SCL Quarry, *Jenneria sandrae*, Sarasota, M. Smith, *Jenneria violetae*.

INTRODUCTION

“The genus *Jenneria* Jousseaume comprises a group of beautiful medium to small *Cypraea*-like shells; they are covered with wart-like pustules on the dorsum and have teeth that extend across the venter. ... *Jenneria* is a paciphile genus [Taxa that lived in the Tertiary (before Recent) Caribbean, now extinct, but survive in the eastern Pacific, *i.e.*, *Jenneria pustulata* (Lightfoot, 1786)]. Its Gatunian fossil record starts in the late early to early middle Miocene Caribbean and it disappears at the end of the early Pleistocene” (Groves and Landau, 2021). The *Jenneria* genus was described in 1884 by Jousseaume as *Cypraea Jenneria* based on the Type species: *Cypraea pustulata* Lightfoot, 1786. In 1967, Olsson updated and revised the description: “Small to medium-sized, *Cypraea*-like shells with ovate to elliptical form, rounded dorsum, covered with solid, wart-like pustules on a transversely threaded surface, the base *Trivia*-like, flattened or a little arched and sculptured with strong cross-ribs terminating in

teeth along the aperture and in pustules along the outer edge. The dorsal furrow is generally weak. The pustules are generally arranged more or less in line, each line connected by a thread, like pearls on a string, except those in the middle of the dorsum, which may stand free. Immature specimens, even with a rounded lip, have no pustules and the sculpture consists only of fine, transverse threads on the upper surface, and partly developed, stronger cross-ribs on the base. The fossula is a large, smooth, excavated pit bounded within by a sharp ridge”.

Relevant Floridian Stratotypes

Golden Gate Member. The Golden Gate Member encompassed the coral/coralline reef structures on the perimeters of the Everglades pseudoatoll in the Plio-Pleistocene. The strata at two of the quarries, the Mule Pen and Bonita Springs Aggregates Quarries, were not differentiated (all coral/coralline limestones) and intertongued. Further, the dragline dredging excavations further mixed the strata within the

spoil piles. No species have been collected in situ, but rather from spoil piles. Some fossil gastropod species have been assigned member status based upon known species from other locations outside the Golden Gate or where a sufficient number of specimens have been collected to render a provisional [P] member status. Absent the former, it is not possible to assign member status if only one or two specimens have been collected from a spoil pile.

Caloosahatchee Formation Members, Pleistocene. In 1958, DuBar described three successive members of the Caloosahatchee Formation (oldest to youngest): Fort Denaud, Bee Branch and Ayers Landing. Of the three, he noted the Fort Denaud Member contained the most widespread and diverse types of environments, including coral patch reefs, stretching from the southeast up into Collier and Sarasota Counties, its northern most extension. Along the Miami Canal in Palm Beach county, the Fort Denaud Member is 4 meters thick, the Bee Branch to 3 meters and the Ayers Landing to 1 meter. To date, no *Jenneria* species have been assigned to the Bee Branch Member.

Bermont Formation. In 1974, DuBar described the younger Bermont Formation which overlays the three Caloosahatchee Members. In 1978, Muriel Hunter applied a semiformal name to the beds in the Belle Glade rock pit as a Member of the Fort Thompson Formation. In 2007, Petuch retained the name but corrected the formation from the late Pleistocene Fort Thompson Formation to the older, mid-Pleistocene Bermont Formation which is widely distributed throughout the Everglades area. (Petuch & Roberts).

NOTE. For a full treatment of the Geology and Paleontology of the Everglades Region, see

Ancient Seas of Southern Florida, Petuch and Berschauer, 2021.

SYSTEMATICS

The zoological position of the genus has undergone considerable revision with Schilder (1924 and 1927), Fehse (2001), Bouchet and Rocroi (2005), Lorenz and Fehse (2009) and Bouchet, Rocroi, Hausdorf, Kaim, Kano, Nützel, Parkhaev, Schrödl and Strong (2017) contributing. Herein, the latter designation, which aligns with WoRMs, is accepted and is reflected herein.

Class Gastropoda
Subclass Caenogastropoda
Order Littorinimorpha
Superfamily Cypraeoidea
Family Ovulidae
Subfamily Pediculariinae
Tribe Cypraediini
Genus *Jenneria* Jousseaume, 1884

The Floridian *Jenneria* species are separate from their Caribbean counterparts. Proposed species linkages between the two have been made by some past authors based on taxonomic characteristics, without aligning the ages or stratigraphy. In regard to the Floridian taxa, Landau and da Silva (2010) state: "In summary, all the taxa described by Petuch (1988, 1991) are probably [emphasis added] synonyms of *J. richardsi*". The statement was based upon the premise that none of characteristics cited by Petuch were diagnostic in terms of establishing separate species status. However, aside from accepting Smith and Olsson's Pliocene strata designations for *J. loxahatchiensis* and *J. richardsi* (in error), the authors do not address the stratigraphic implications of the various Formations and their Members.

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Jenneria Species

<u>Described Species</u>	<u>Type Locality</u>	<u>Age</u>
<i>J. lindae</i> Petuch, 1988	Old Mule Pen Quarry, East Naples, Collier County	Golden Gate Member, Plio-Pleistocene
<i>J. violetae</i> Petuch, 1991*	APAC Pit, Sarasota	?
<i>J. richardsi</i> Olsson, 1967	Dade-Collier County Line	Fort Denaud Member, Caloosahatchee Formation
<i>J. keatonae</i> Petuch, 1991	Miami Canal, 16 km. south of Lake Harbor	Ayers Landing Member, Caloosahatchee Formation
<i>J. loxahatcheensis</i> Smith, 1936	Loxahatchee, Palm Beach County	Holey Land Member, Bermont Formation
<i>J. hepleri</i> Olsson, 1967	Miami Canal	Holey Land Member, Bermont Formation

*synonym of *J. lindae* (per Petuch and Berschauer)

New Species

<i>J. sandrae</i> , new species	Rinker Materials SCL Quarry, Miami	Belle Glade Member, Bermont Formation
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As such, Landau and da Silva’s statement is not definitive and is insufficiently supported without further elaboration.

Jenneria sandrae Daughenbaugh, new species
(Plate 1, Figures A-D)

Description. Ovate-elliptical, breadth to length ~ 1 to 2; anterior extremity slightly protruding, posterior extremity slightly puckered (pinched); sulcus indistinct; dorsal pustules small, numerous, evenly distributed; threads connecting dorsal pustules absent/obsolete; marginal pustules connected to the basal riblets; columellar riblets 13, ending with small nodes at the apertural lip, with shorter riblets between; labral riblets 21; base slightly rounded on the columellar side, less so on the labial side; aperture narrow, wider anteriorly; fossula smooth, short, protruding pit. Size: 23.9 mm

Holotype. Los Angeles County Museum of Natural History, LACMNH *to be determined*.

Type Locality. Rinker Materials SCL Quarry, Miami, Dade County, Florida

Etymology. Named for Sandy Kendrew, the wife of Eric Kendrew, who passed in 1998.

Stratotype. Belle Glade Member, Bermont Formation [Chibanian Age (~750 ka)], Late Middle Pleistocene.

Discussion. The holotype was collected by Eric Kendrew from the Rinker Materials SCL Quarry Pit, Miami in June, 2010 (Eric Kendrew, personal communication, 2022). Petuch has provided additional comments: “There is a small layer of the Coffee Mill Hammock Member of the Fort Thompson Formation exposed in the Rinker Pits, but that has very few species in it and they are all typical latest Pleistocene species ... the majority of well-preserved fossils in the Rinker pits are from the Belle Glade Member. ... I would bet that *sandrae* is also a Belle Glade Species.” (Petuch,

personal communication, 2022). As such, *J. sandrae*'s placement in the Belle Glade Member of the Bermont Formation is considered provisional. *Jenneria sandrae* represents the last of Florida's fossil *Jenneria*. It is likely a descendent of the older *J. hepleri*.

Description *Jeneria hepleri*. "The shell is of medium size, ovate, with an evenly rounded dorsum and slightly pouting anterior and posterior ends. The base is slightly convex on the body side, less so on the lip, the aperture narrow in the middle, wider in the anterior section. Pustules are relatively few and large as compared with the other Florida forms and are connected with coarse, axial threads which show well on the sides: under dark light, the pustules or tubercles are ringed as in *richardsi*. Cross riblets on the base as shown in the figure terminate at the aperture in small nodes on the body side."

Size. 20.8-22.0 mm.

Comparison. Olsson correctly states that the characteristics of *J. hepleri* safely separates it from the other described Floridian fossil *Jenneria* of the time. That is also true of all older species described by Petuch. *Jenneria sandrae*, described herein, is only comparable to the older Holey Land Member, *J. hepleri*. However, the latter's ovate shape, larger and fewer pustules, and presence of dorsal connecting threads safely separates the two species (see Plate 1, Figures E-G).

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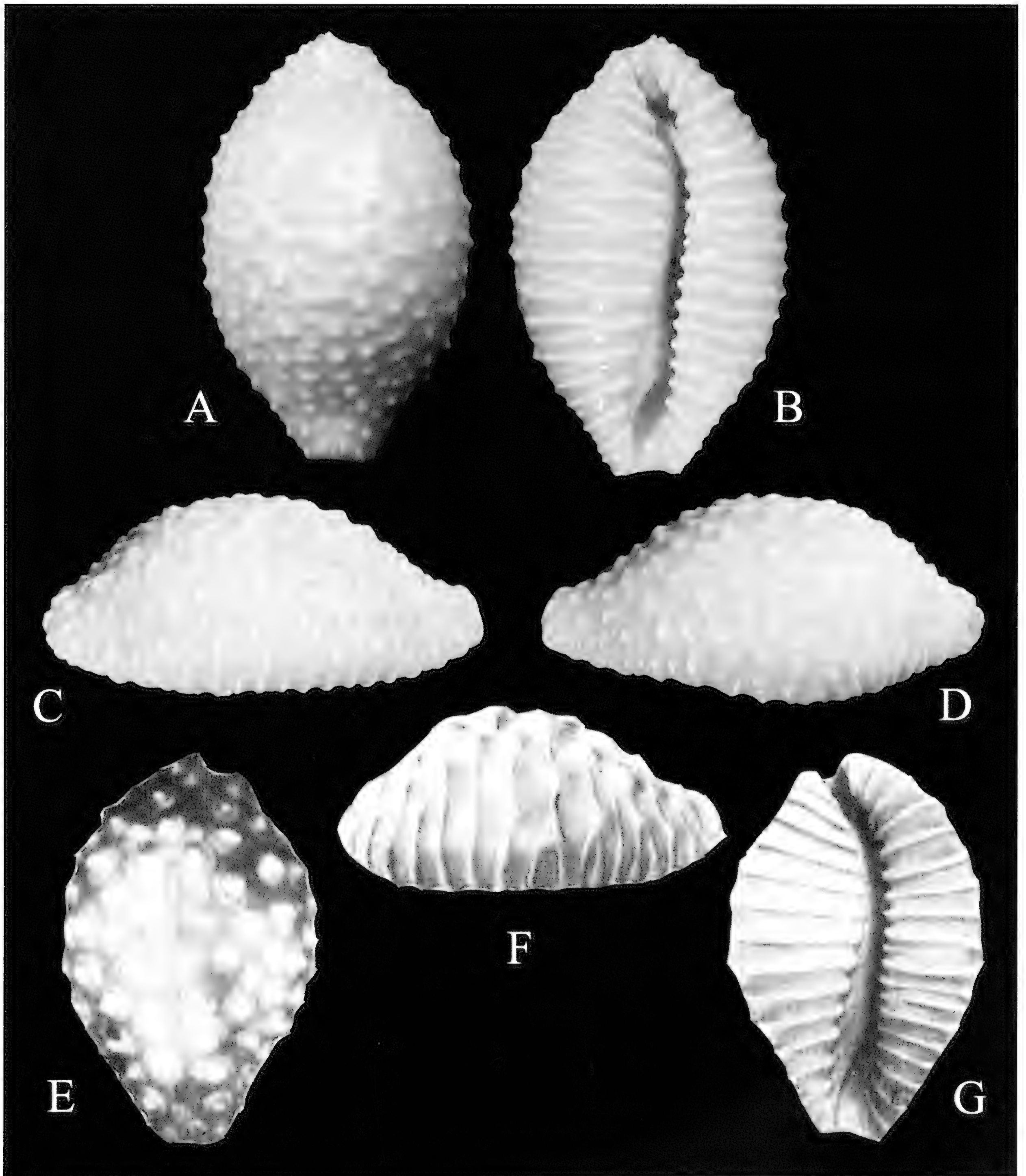


Plate 1. New fossil *Jenneria* species.

A-D= *Jenneria sandrae* new species, Holotype, 23.9 mm in length, Rinker Materials SCL Quarry, Miami, Dade County, Florida. E-G= *Jenneria hepleri* Olsson, 1967, 20.8 mm. Miami Canal, Florida.

Different morphs of *Umbonium vestiarium* (Gastropod) from the Bay of Bengal, Bangladesh coastal zone

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ABSTRACT As ecologically and economically, marine gastropod mollusca are highly significant in the benthic ecosystems. Among marine gastropods, *Umbonium vestiarium* (Linnaeus, 1758) is a key stone species in marine ecosystems. Adult *Umbonium vestiarium* from coastal areas in Bangladesh including Cox's Bazar, Sonadia and the St. Martin's Islands typically range from 1-2 cm, and exhibit extensive colour polymorphism.

KEYWORDS Mollusca, Gastropod, *Umbonium*

INTRODUCTION

In the Bay of Bengal, Bangladesh area is an important zone for marine mollusca or shellfish. Marine Mollusca are most diversified group in the benthic ecosystem which can provide heterogeneous habitats to influence developments such as colonization and a rich diversity supported with other organisms (McLean 1983, Coen and Grizzle 2007, Commiato *et al.* 2008). Mollusca are used for different purposes such as ornamental, food, decoration, tool and as resources of currency (Maurer 2006, Bar-Yosef Mayer *et al.* 2010, Çakırlar 2011). In the benthic community, *Umbonium* shell is very important for commercial purpose as marine resources so shell collection management should be properly monitored. In particular, the Bay of Bengal keystone gastropod species which is exploited economically is *Umbonium vestiarium* (Linnaeus, 1758).

The ecological importance of *U. vestiarium* is highlighted in its role as an indicator species for heavy metals. As a calcined snail, the shell acts a novel bio-adsorbent for cobalt ion elimination from the aqueous solutions (Foroutan *et al.* 2019). The use of shells through time can, therefore, be used as important tape recorder and bio-monitor for diversification and the environmental changes. As distribution marine benthic species are appearance among the geographical area which is the spatial organisms as bio-monitor scale (Underwood and Petraitis 1993). Furthermore, shifts in climate, such as seasonal shift in the timing of monsoons, affect the recruitment rates of *U. vestiarium*, and can threaten localized populations (Sivadas *et al.* 2012).

Similarly a threat to *U. vestiarium* is its commercial application. These species common name is Button Top or Vesta's Button Top, and is locally known as Chaptā Shamuk and Pachano Shamuk. It's dominated the macro-

benthic density in the subtidal sandy mud bottoms and contributes to the food web as a filter-feeder (Sivadas *et al.* 2011). This species used as ornament for home materials decoration and jewelry for woman and other decorative objects (Poutiers 1998; Appukuttan & Ramados 2000). Other human impacts such as shifts in onshore land use, which affects runoff and turbidity, dredging, and over exploitation makes this species is vulnerable (Cheung *et al.* 2005). This species used as nutritional food in the Philippines.

METHODS AND MATERIALS

Field survey and research conducted during January to November 2015 in the coastal area of Cox's Bazar, the Sonadia and the St. Martin's Islands, Bangladesh. From the coastal area an opportunistic search resulting in a random sample of *U. vestiarius* was collected by hand and packed with polybag and then transfer to lab for preservation and identification. The target species was identified based on morphological characteristics of the shell and reference to types and literature (Linnaeus 1758; Siddiqui *et al.* 2007).

SYSTEMATIC PART

Umbonium vestiarius (Linnaeus, 1758)
(Figure 1, A-D)

Synonyms: *Trochus vestiarius* (Linnaeus, 1758); *Globulus australis* (Philippi, 1748); *Rotella lineolata* (Lamarck, 1822), *Umbonium vestiarius* (Link, 1807); *Trochus aequalis* (Wood, 1828).

Description.

This shell is much wider than elongated, plain, polished and very little than other gastropods. Solid depressed, lenticular structure is present. The body shape is a rounded, floating suture,

tiny spire, and grows slightly convex. Especially colorful overlapping whorl shows the unique character. A large sub-circular callus pad is present that covers the umbilicus. The aperture is ovate and the outer lip sharp, inside is smooth. The operculum is circular. The columella is smooth and anteriorly strongly curved. This species shell size grows maximum up to 2 cm in the marine water.

Color and Pattern.

Umbonium vestiarius shows the polymorphism characters which demonstration different colors, sizes, shapes and patterns (Leimar 2005). The variable outer surface is polished with a highly gloss, shades of grey, brown, olive green, pink, red, yellow or even white, nearly uniform or with various axial or spiral patterns. Umbilical callus usually showed different color from the shell (Kait & Woo 2010). The level of color variability and diversity is highly localised. In Parangipettai, south eastern India, three basic colours were observed, with a total of twenty-four variants of these three morphs (Sivadas *et al.* 2011). In contrast, eleven colour morphs in a population from Ratnagiri, mid-western coast of India, while four colour morphs were recorded in Kalbadevi, north-western India (Sivadas *et al.* 2011). In this study four color morphs were recorded, each having a high degree of pattern plasticity (Figure 1).

Distribution.

The different morph of this gastropod species recorded from Cox's bazar, Sonadia, Saint Martin Island, and the coastal zone of Bay of Bengal, Bangladesh is introduced and comparatively reported as first time. Other literary reports indicate that this species is found seventeen countries/island chains including: India (Fretter 1975), Indo-Pacific, South and east Africa, Indonesia, Singapore, Philippines,

Australia (Kilburn 1977), Myanmar (Naung 2018).

Habits and Habitat.

Generally, this species is a filter feeder and actively feed in the marine water. But these species feeding behavior activities are high at the high tide, and very low feeding activity shown at low tide (Fretter 1975). This species lives in the sub-tidal sandy, mud bottoms, low tide and shallow sub-tidal water. It's found in the benthic, brackish environment and depth range is 0 - 5 m (Poutiers, 1998).

CONCLUSION

In the benthic ecosystem different types of shell are present in the coastal area of Bay of Bengal. Species wise morph study is highly important for the identification of polymorphism characters and behavior. Marine mollusks are very important not only for diversification but also biochemical, acidification and climate change research in the ocean science.

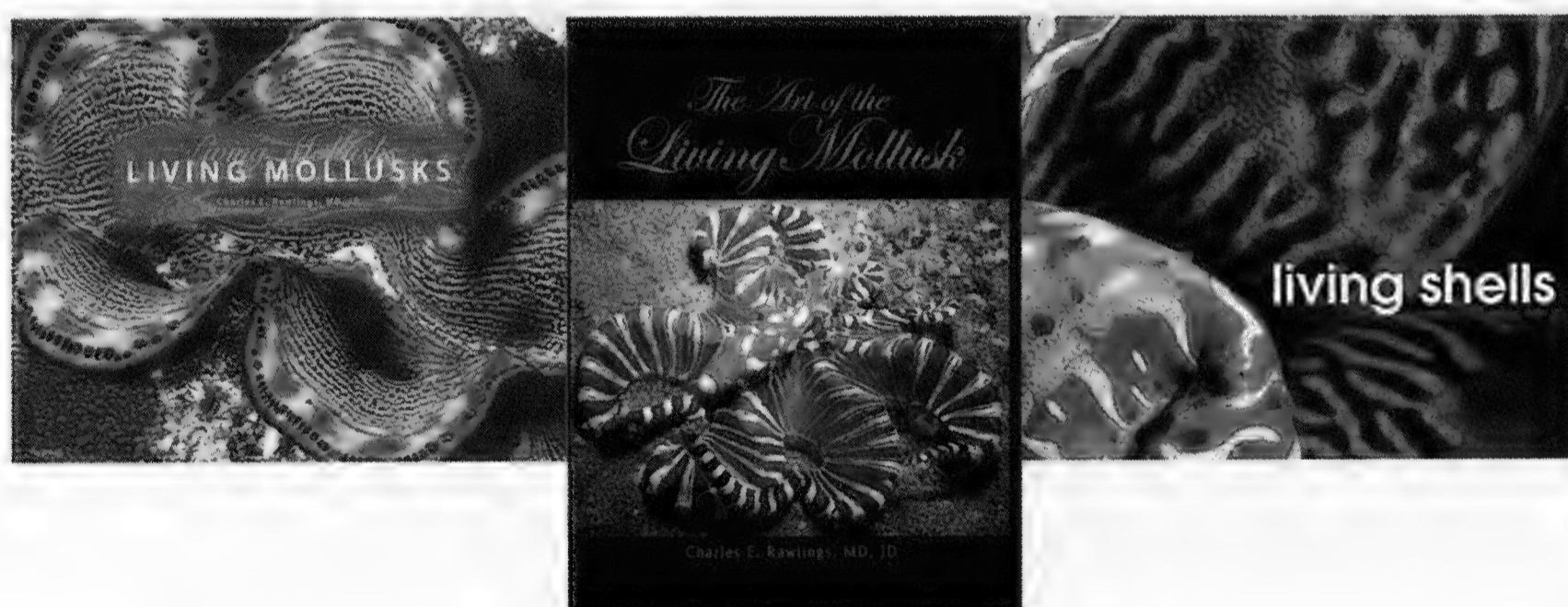
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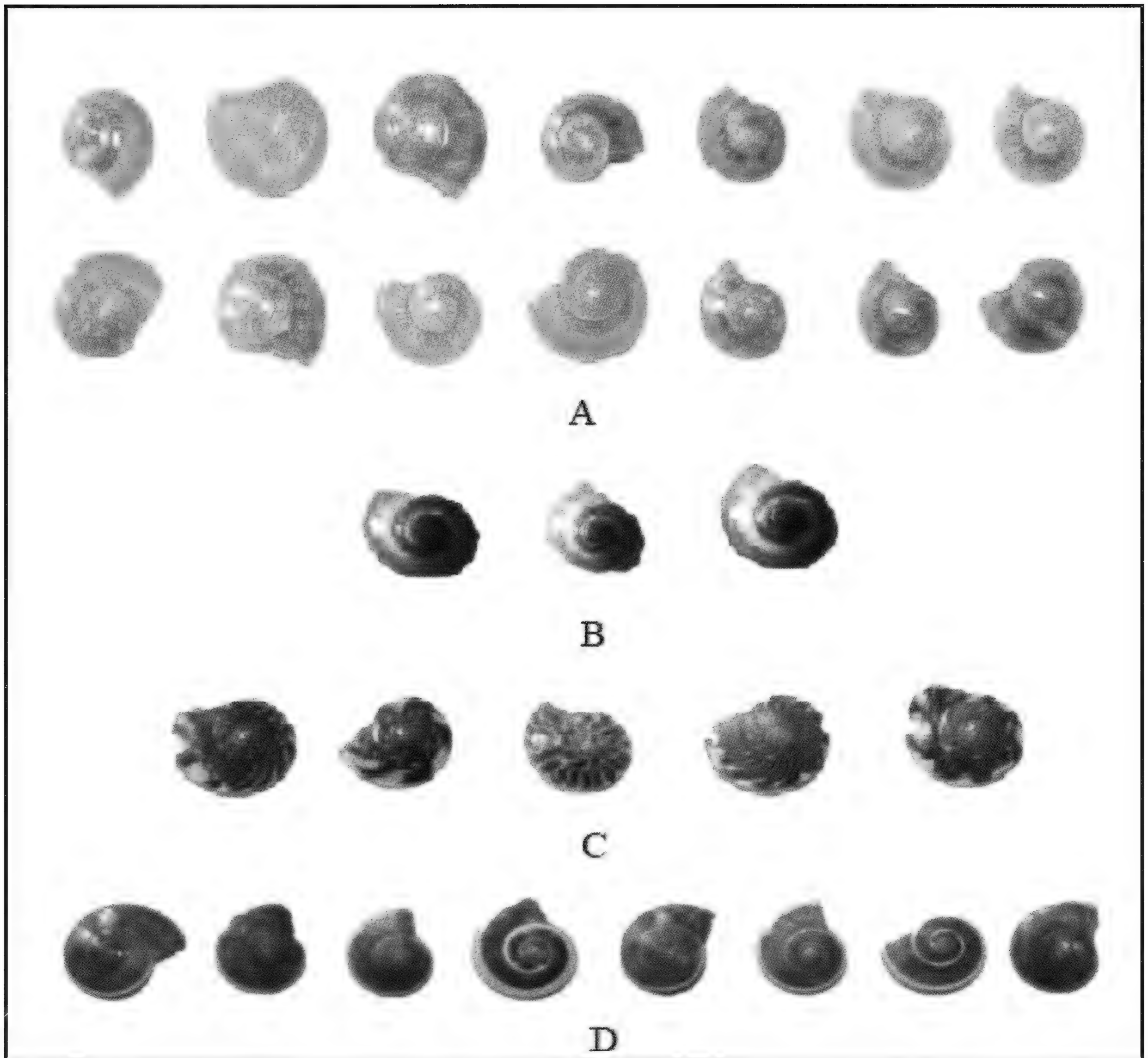


Figure 1. The four basic morphs of *Umbonium vestiarius* from coastal area of Cox's Bazar, Bangladesh (size 1-2 cm).

A New Species of *Laevistrombus* (Gastropoda: Strombidae) from the Gulf of Thailand, Northern Borneo and Southern Philippines

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ABSTRACT A new species of genus *Laevistrombus* (Family Strombidae) is described from the northeastern Gulf of Thailand, northern Borneo and southern Philippines. *Laevistrombus maxwelli* sp. nov. is conchologically differentiated from other species in the Genus *Laevistrombus* and its complex.

KEY WORDS *Gastropoda*, *Strombidae*, *Laevistrombus maxwelli*, Thailand, Borneo, Philippines

INTRODUCTION

Laevistrombus Abbott, 1960 is distributed throughout the tropical western Pacific to eastern Indian Ocean. Dekkers *et al.* (2021) have subdivided *Laevistrombus* in to two subgenera, namely *Laevistrombus* (s. str.) and *Gonggongus* based on morphology: *Laevistrombus* (s. str.) includes the species with chevrons in the design and mostly no varices on the laterospire, while *Gonggongus* is devoid of chevrons and the shell typically bears varices on later whorls. (Dekkers, *et al.*, 2021 p.5).

Some species of *Laevistrombus* are very common but some are very rare and endemic such as *L. guidoi* Man in't Veld & De Turck, 1998 endemic to New Caledonian areas, *L. vanikorensis* (Quoy & Gaimard, 1834) endemic to north eastern Australia, and Vanuatu – Esprito Santo, Efate, Malakula (Maxwell *et al.* 2019), Port Vila (Man in 't Veld & De Turck, 1998), Villa Bay (Cernohorsky 1972). *Laevistrombus* (*Gonggongus*) *taeniatus* (Quoy & Gaimard, 1834) around Indonesia - Ambon (Maxwell *et al.* 2019), Australia – Murray Island (Melvill & Standen 1899) Papua New Guinea – Porebada (Hinton 1972), Hula (Hinton, 1972), Hula Village (Maxwell *et al.* 2019),

Manus Island, Admiralty group (Hinton 1972), Loyalty Island (Man in 't Veld & De Turck 1998), Solomon Islands (Maxwell *et al.* 2019) Boli Passage (Maxwell *et al.* 2019).

Abbreviations.

CGSC = Chorchat Gra-tes Shell Collection

G. = *Gonggongus*

L = length (protoconch to tip of anterior canal)

L. = *Laevistrombus*

mm. = millimeter

Para. = Paratype

Spm. = Specimen number

W = width

W/L = Ratio between Width and Length. If over 0.5 the shell is broad, if less than 0.5 the shell is slender.

ZRCBUU = Zoological Research Collection of Burapha University, Chonburi, Thailand.

MATERIAL AND METHODS

The description of shell characters and morphological analyses were obtained from dry empty shells. Specimens of *L. canarium* (Linnaeus, 1758), *L. (Gonggongus) turturella* (Röding, 1798), *L. (Gonggongus) turturella* (Röding, 1798) (Synonym *L. (Gonggongus)*

isabella Lamarck, 1822), *L. vanikorensis* (Quoy & Gaimard, 1834) and *L. guidoi* Man in't Veld & De Turck, 1998 are in Chorchat Gra-tes Shells Collection and are used for comparison with new taxa.

SYSTEMATIC PART

Family Strombidae Rafinesque, 1815

Genus *Laevistrombus* Abbott, 1960

Laevistrombus maxwelli Gra-tes, new species
(Plate 6, Figures 1-8)

Description. *Laevistrombus maxwelli*, sp. nov. is smooth and solid. The surface is slightly glossy. The shell is triangulated ovate and heavy in comparison to its size. The body is very broad in comparison to its length. Aperture is wide posteriorly, narrower anteriorly. Outer lip is much thickened. Columella is much thickened from its center to its anterior. The outer lip at the posterior canal is curved up toward the second suture. Between the posterior canal and outer lip is curved with thin thicken lip. The inside of columella and aperture is white. Teleoconch shape is moderately high, triangulate and broad, with up to nine whorls and no varices on the later spire that match the description of *Laevistrombus* (Deckkers *et al.* 2021). From the lip, the margin curves concavely downward (deviation downward from axis) and expanded out from the axis. This made the shell very broad. The stromboid notch is moderate. The color of *L. maxwelli*, sp. nov. is solid white and light tan with a pattern of light tan longitudinal lines. On the last body whorl, the tan color of the shell is lighter toward the inner lip, darker on the body whorl and solid white toward the outer lip. The inner lip and aperture is white with white to light grey columella. Periostracum: is light brown, thin to very thin.

Type Material. The Holotype is deposited in the Zoological Research Collection of Burapha University, Chonburi, Thailand. Holotype: ZRCBUU 0949, 54.1 mm. (ex. CGSC 6299-4039). The Holotype and paratypes of *L. maxwelli* sp. nov. were collected in the northern Gulf of Thailand. Paratype: 7 specimens CGSC 6299-4040 to CGSC 6299-4046 are in Chorchat Gra-tes Shells Collection.

Type Locality. Chonburi, northeast of the Gulf of Thailand. Holotype and paratypes were caught on sand surface and some buried in sand at low tide.

Distribution. *Laevistrombus maxwelli*, sp. nov. is found along the coast of Chonburi to Trad province, northeastern Gulf of Thailand. Specimens were collected on sand and in sand at low tide. The new species is also known from northern Borneo and southern Philippines.

Etymology. This species is named after Stephen J. Maxwell, Faculty of Science and Engineering, James Cook University, Cairns, Australia, who devoted time study and did a lot of research with outstanding outcome on the Family Strombidae.

DIFFERENTIAL DIAGNOSIS

By comparing a large number of specimens of each species, the morphological differences between species can be seen to be distinct. A summary of those morphological differences is below.

***Laevistrombus maxwelli*.** Upper body whorl is globose. Dorsal color is white. On the last body whorl, the tan color of the shell is lighter toward the inner lip, darker on the body whorl and solid white toward the outer lip. The shell is broad compare to its length. Spire high and wide as

compare to other *Laevistrombus* species. Forty-four specimens of *L. maxwelli* were used for comparison.

<i>Laevistrombus maxwelli</i>				
	W (mm)	L (mm)	W/L (mm)	Weight (gm)
Holotype	38.4	54.1	0.709	19
Para. 1	38.0	56.0	0.678	24
Para. 2	42.5	58.0	0.732	32
Para. 3	43.8	60.4	0.725	32
Para. 4	42.6	63.4	0.671	31
Para. 5	40.0	58.8	0.680	23
Para. 6	41.5	54.0	0.768	25
Para. 7	42.1	57.1	0.737	27
Average			0.713	

Table 1. Dimension and weight of *Laevistrombus maxwelli*.

Laevistrombus canarium (Linnaeus, 1758).
Upper body whorl is globose. Base dorsal color is white with brown or brown tan wavy line. Spire moderately low but wide as compare to other *Laevistrombus* species. The upper lip toward the posterior end is straight. 9 specimens were used for comparison.

<i>Laevistrombus canarium</i> (Linnaeus, 1758)				
	W (mm)	L (mm)	W/L (mm)	Weight (gm)
Spm. 1	47.0	60.4	0.778	47
Spm. 2	44.4	57.4	0.773	39
Spm. 3	42.6	56.8	0.750	42
Spm. 4	43.2	60.6	0.712	42
Spm. 5	40.5	56.4	0.718	31
Spm. 6	39.5	55.0	0.718	27
Spm. 7	38.7	56.0	0.691	34
Spm. 8	40.2	54.1	0.743	26
Average			0.735	

Table 2. Dimension and weight of *Laevistrombus canarium* (Linnaeus, 1758).

Laevistrombus guidoi Man in't Veld & De Turck, 1998.
Shell is white and fusiform. Upper outer lip pointed up. Spire moderately high and wide as compare to other *Laevistrombus* species. One specimen was used for comparison.

Laevistrombus liveranii Dekkers, Rymer & S. J. Maxwell, 2021.
Shell smooth, solid and heavy comparison to its size. Shell slender relatively low to high spire. The margin curve concavely upward and bends back in some specimens. In some specimens with some narrow varices on the whorl with up to 18 radial lines on the anterior portion of the body whorl (Dekker *et al.* 2021).

Laevistrombus vanikorensis (Quoy & Gaimard, 1834).
Triangulary ovate, base dorsal color is white with brown purple or brown tan zigzag line. Spire is moderately high and moderately wide as compare to other *Laevistrombus* species. Four specimens were used for comparison.

Laevistrombus (Gonggongus) turturella (Röding, 1798) (from the Philippines).
Shell triagulary fusiform, dorsal color is brown tan to light tan spire narrow and high as compare to other *Laevistrombus* species. Upper outer lip is round. Apex is slender, pointed and become broader at the lower whorl. As compare to *L. (Gonggongus) turturella* (Roeding, 1798) (Synonym *L. isabella* Lamarck, 1822), the apex of *L. (Gonggongus) turturella* (Roeding, 1798) is narrow and high while *L. (Gonggongus) turturella* (Röding, 1798) (Synonym *L. isabella* Lamarck, 1822) is broader from protoconch down to the shoulder of last whorl. Ten specimens were used for comparison.

<i>Laevistrombus (Gonggongus) turturella</i> (Röding, 1798)				
	W (mm)	L (mm)	W/L (mm)	Weight (gm)
Spm. 1	61.5	103.0	0.597	67
Spm. 2	64.3	101.2	0.635	73
Spm. 3	64.9	99.6	0.651	62
Spm. 4	64.8	109.2	0.593	95
Spm. 5	64.5	104.8	0.615	80
Spm. 6	63.0	98.0	0.642	75
Average			0.622	

Table 3. Dimension and weight of *Laevistrombus (Gonggongus) turturella* (Röding, 1798).

Laevistrombus (Gonggongus) turturella (Röding, 1798) (Synonym *L. isabella* Lamarck, 1822) from southwest Thailand (Andaman Sea). Triangular fusiform, dorsal color is purplish brown to tan, spire broader and moderately high as compare to other *Laevistrombus* species. Upper outer lip is round. When compare to *L. (Gonggongus) turturella* (Röding, 1798) the spire of *L. isabella* Lamarck, 1822 (that was placed as a synonym of *L. (Gonggongus) turturella* (Röding, 1798)) is broader and medium high. The spire is not as high as *L. (Gonggongus) turturella* (Röding, 1798) and not as low as *L. canarium* (Linnaeus, 1758). Thirty-nine specimens were used for comparison.

<i>Laevistrombus (Gonggongus) turturella</i> (Röding, 1798) (Synonym <i>L. isabella</i> Lamarck, 1822)				
	W (mm)	L (mm)	W/L (mm)	Weight (gm)
Spm. 1	41.9	67.8	0.618	19
Spm. 2	40.6	63.8	0.636	20
Spm. 3	39.5	64.4	0.613	17
Spm. 4	44.8	68.8	0.651	23
Spm. 5	42.9	66.8	0.642	21

Spm. 6	41.9	66.8	0.627	19
Spm. 7	42.7	71.0	0.601	21
Spm. 8	39.5	61.0	0.647	20
Average			0.629	

Table 4. Dimension and weight of *Laevistrombus (Gonggongus) turturella* (Röding, 1798) (Synonym *L. isabella* Lamarck, 1822).

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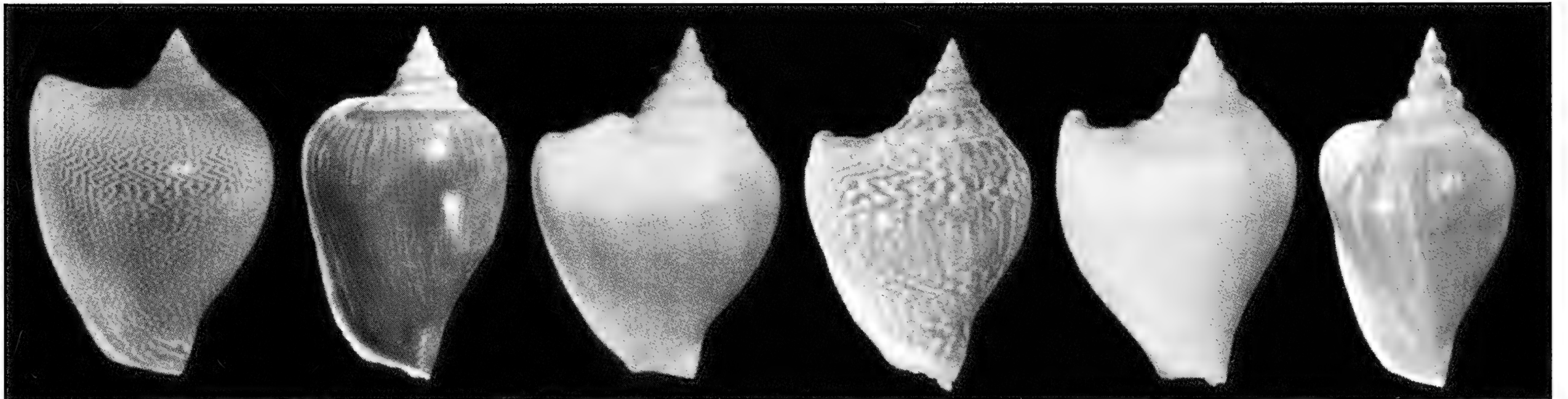


Plate 1. Left to right, *L. canarium* (Linnaeus, 1758), *L. (Gonggongus) turturella* (Röding, 1798) (Synonym *L. (Gonggongus) isabella* Lamarck, 1822), *L. maxwelli* sp. nov., *L. vanikorensis* (Quoy & Gaimard, 1834), *L. guidoi* Man in't Veld & De Turck, 1998 and *L. (Gonggongus) turturella* (Röding, 1798). All specimens are from Chorchat Gra-tes Shell Collection.

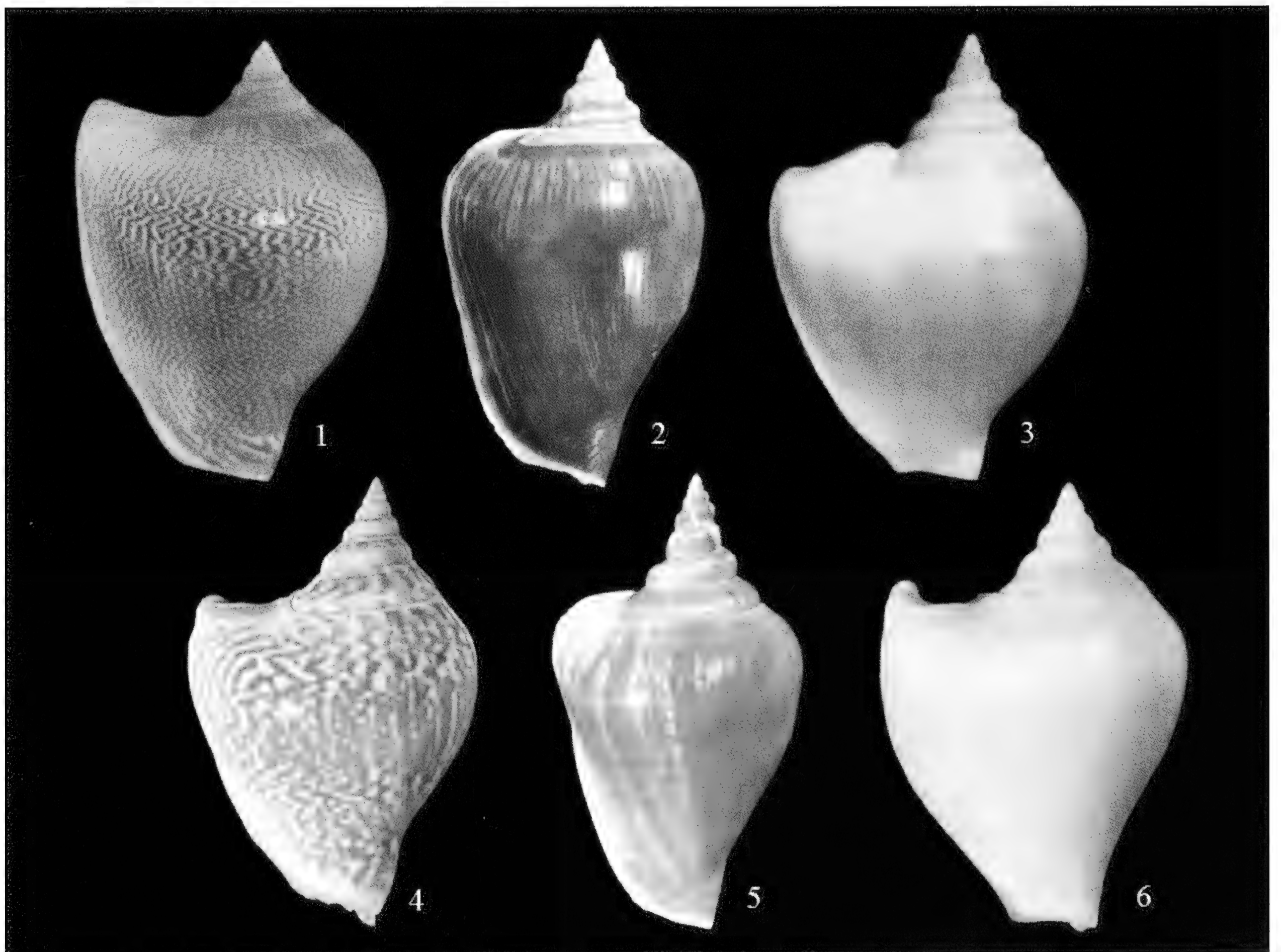


Plate 2. Fig.1 - *L. canarium* (Linnaeus, 1758) (Keelamkarai, India, 57.4mm.), Fig. 2 - *L. (Gonggongus) turturella* (Röding, 1798) (Synonym *L. isabella* Lamarck, 1822) (extreme south Thailand, Andaman Sea, 67.8 mm.), Fig.3 - *L. maxwelli* sp. nov. (Chonburi, Thailand, 54.1 mm), Fig. 4 - *L. vanikorensis* (Quoy & Gaimard, 1834) (North Queensland, Australia, 37.6 mm.) Fig. 5 - *L. (Gonggongus) turturella* (Röding, 1798) (Philippines, 103.0 mm.) and Fig. 6 - *L. guidoi* Man in't Veld & De Turck, 1998 (New Caledonia, 52.7 mm). All specimens are from Chorchat Gra-tes Shell Collection.

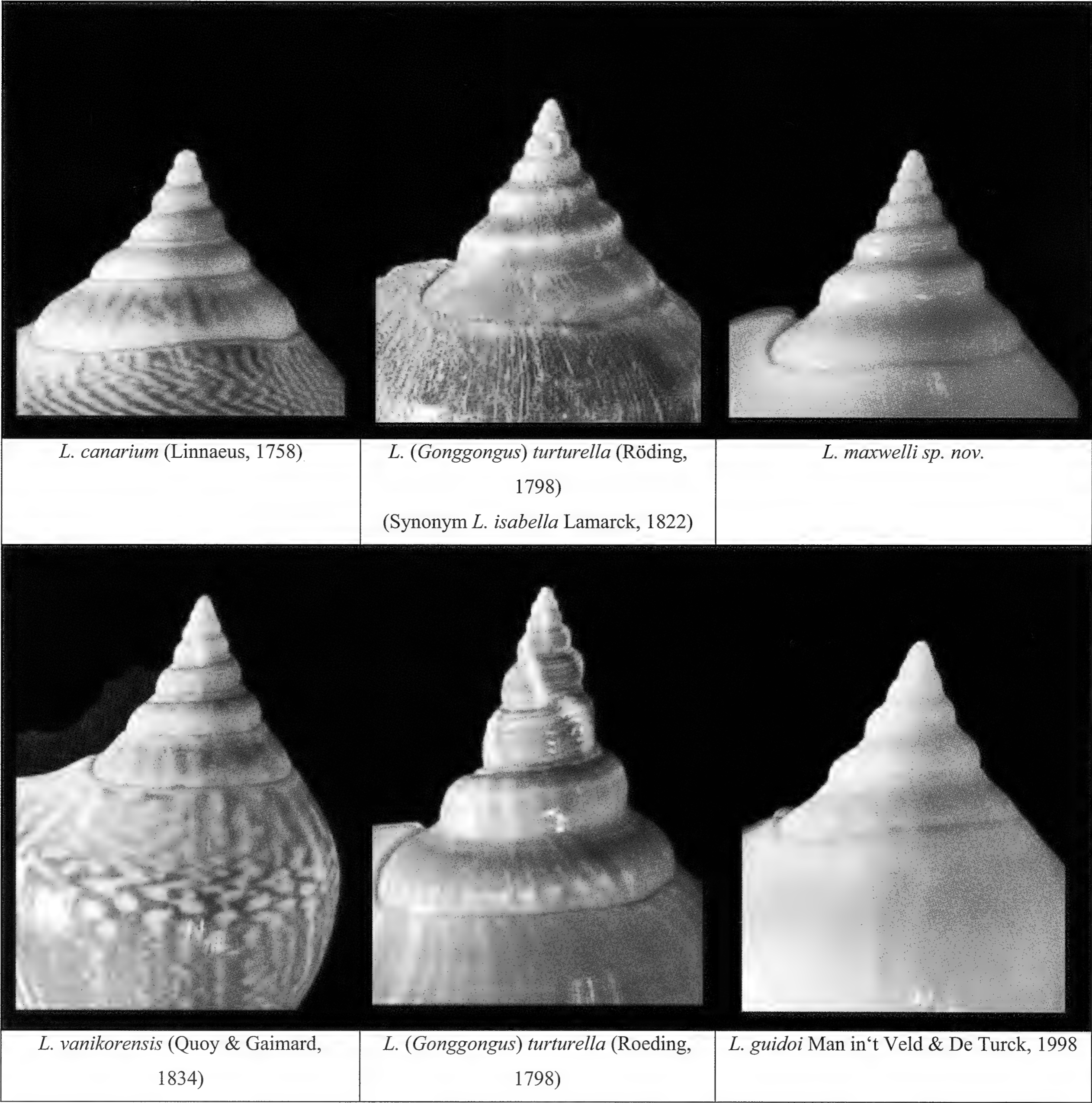


Plate 3. Comparison of apex in *Laevistrombus*.

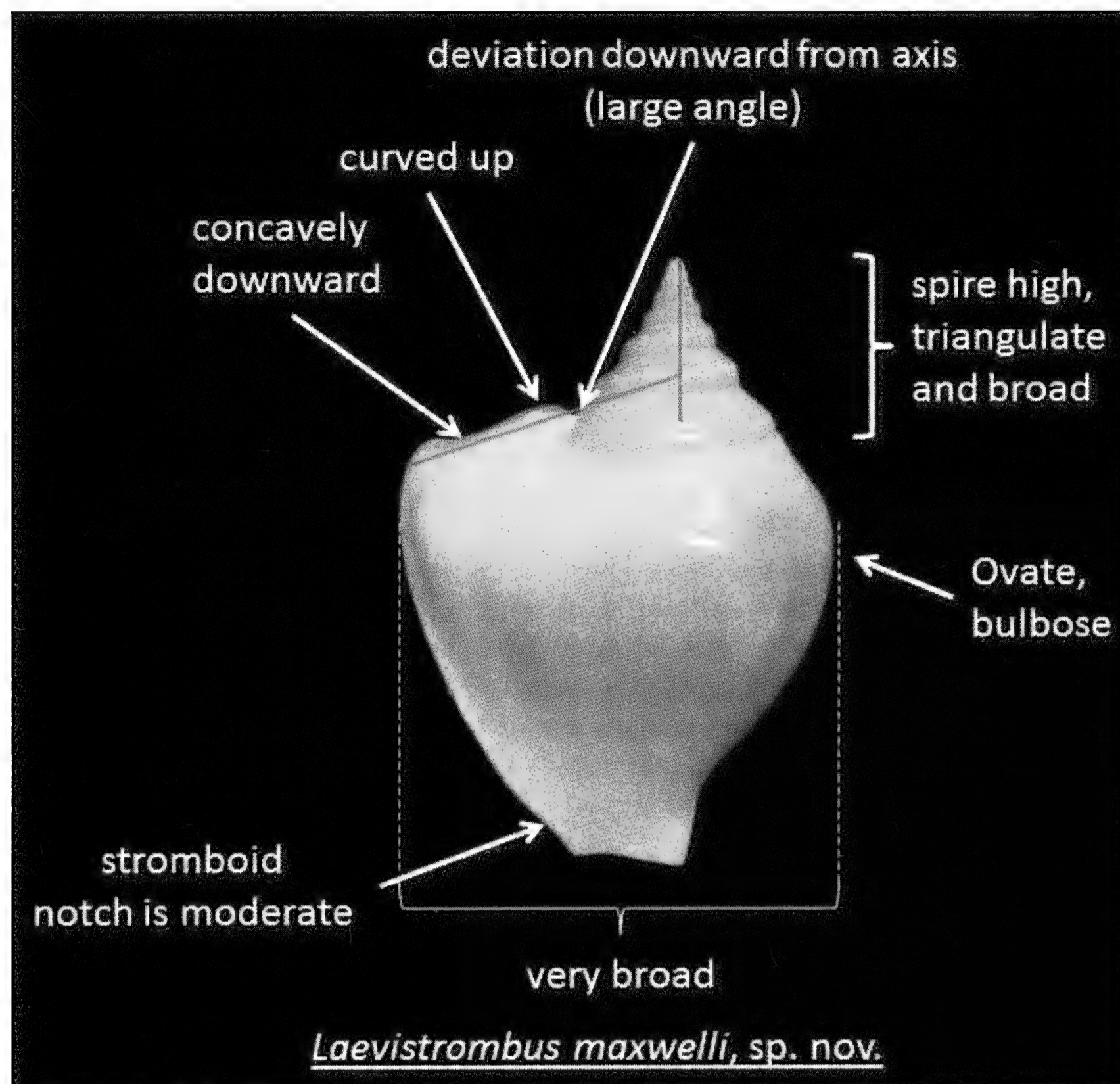


Plate 4. *Laevistrombus maxwelli*, sp. nov.

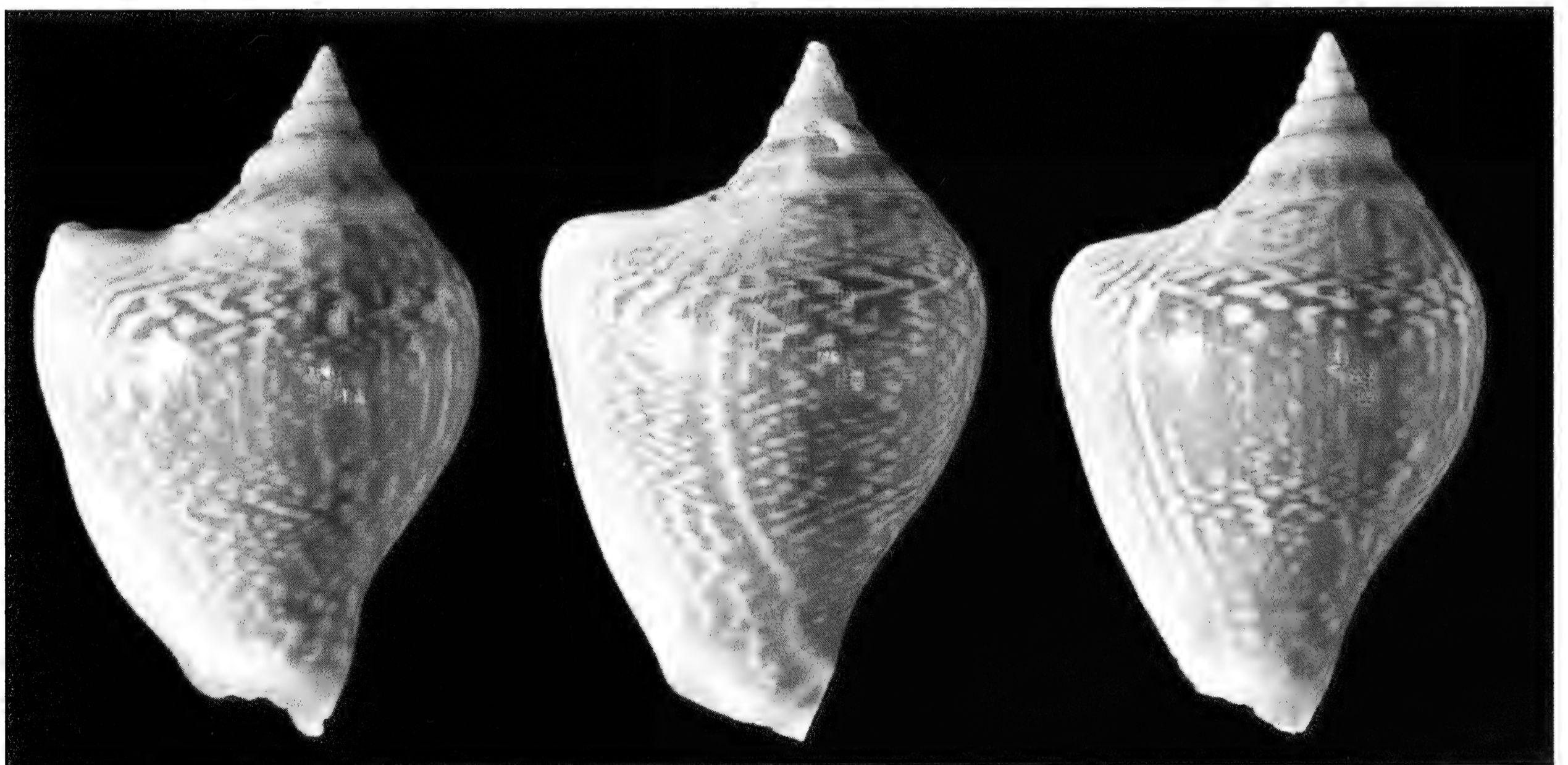


Plate 5. *Laevistrombus vanikorensis* (Quoy & Gaimard, 1834) Dingo Beach, North Queensland, Australia. 37.7 mm., 39.5 mm. and 40.1 mm.

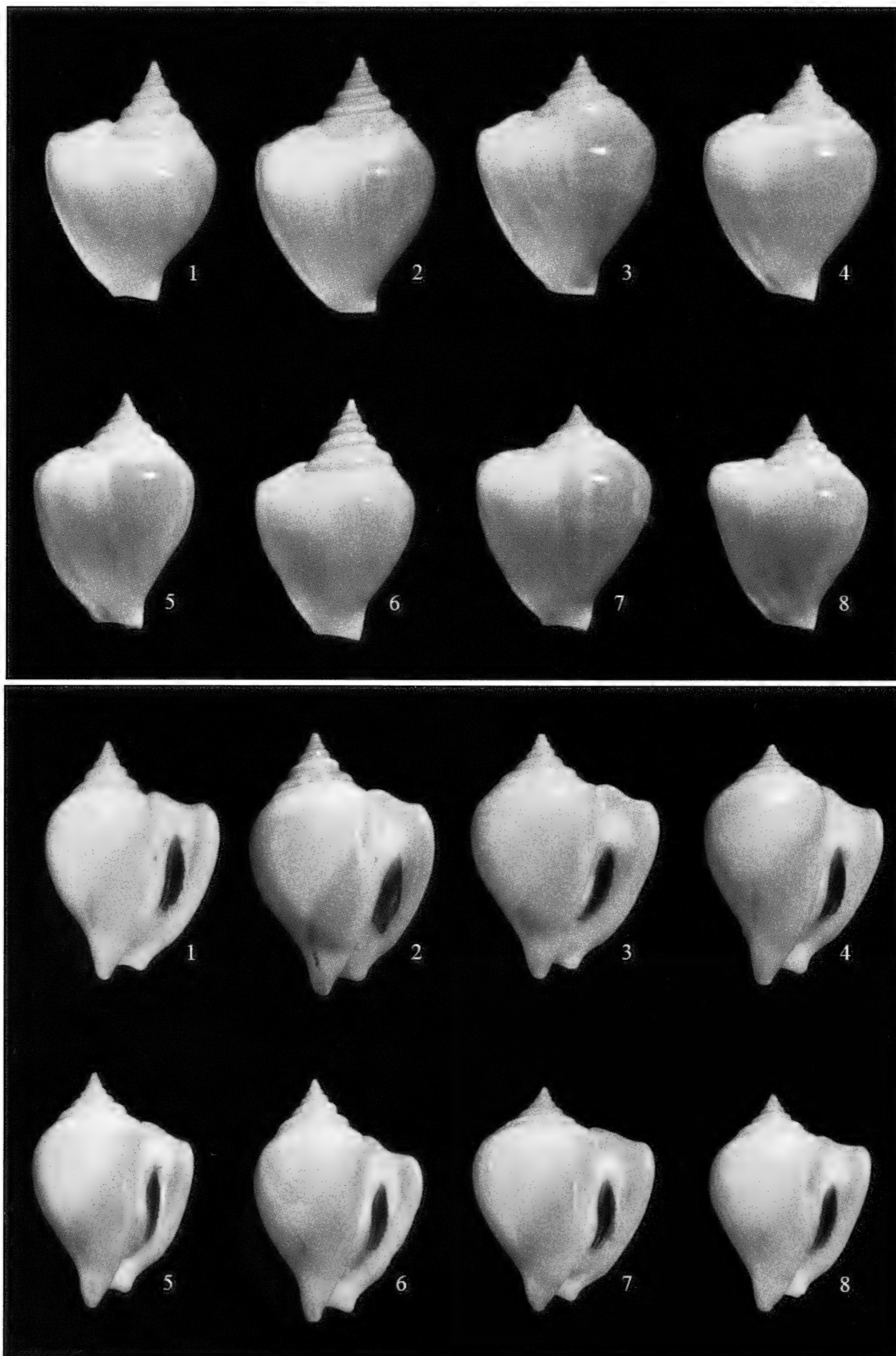


Plate 6. *Laevistrombus maxwelli*, sp. nov. (Chonburi, Thailand). Holotype (Fig. 1) and 7 Paratypes (Fig. 2 – Fig. 8). Size from Fig. 1 to Fig. 8 are 54.1 mm., 56.0 mm., 58.0 mm, 60.4 mm, 63.4 mm., 58.8 mm, 54.0 mm and 57.1 mm respectively. Holotype is in ZRCBUU collection. All Paratype specimens are from Chorchat Gra-tes Shell Collections.

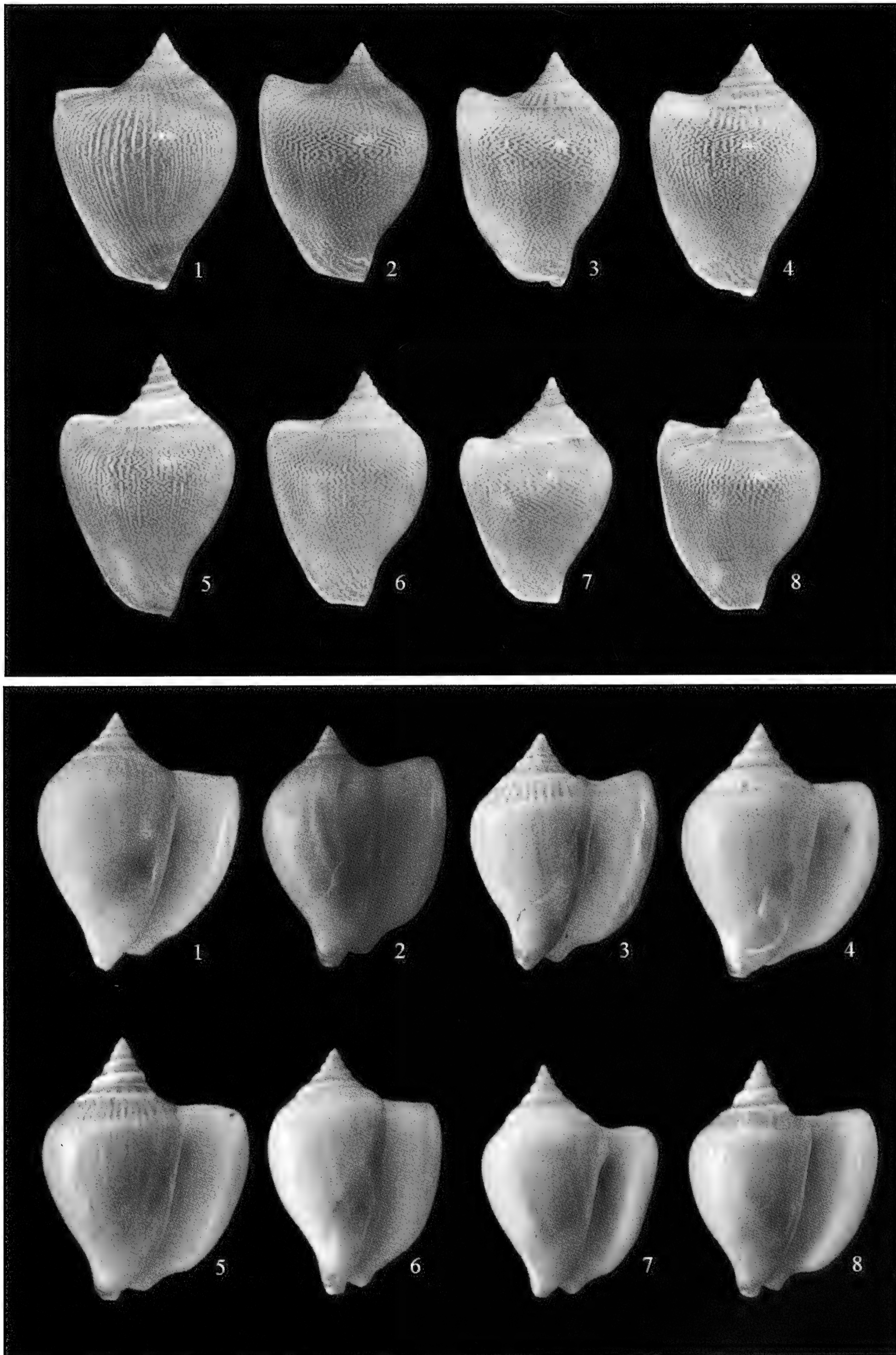


Plate 7. *Laevistrombus canarium* (Linnaeus, 1758) (Keelamkarai, India). All 8 specimens are from Chorchat Gra-tes Shell Collections. Size from Fig. 1 to Fig. 8 are 60.4 mm, 47.4 mm, 56.8 mm, 60.6 mm, 56.4 mm, 55.0 mm, 56.0 mm and 54.1 mm respectively.

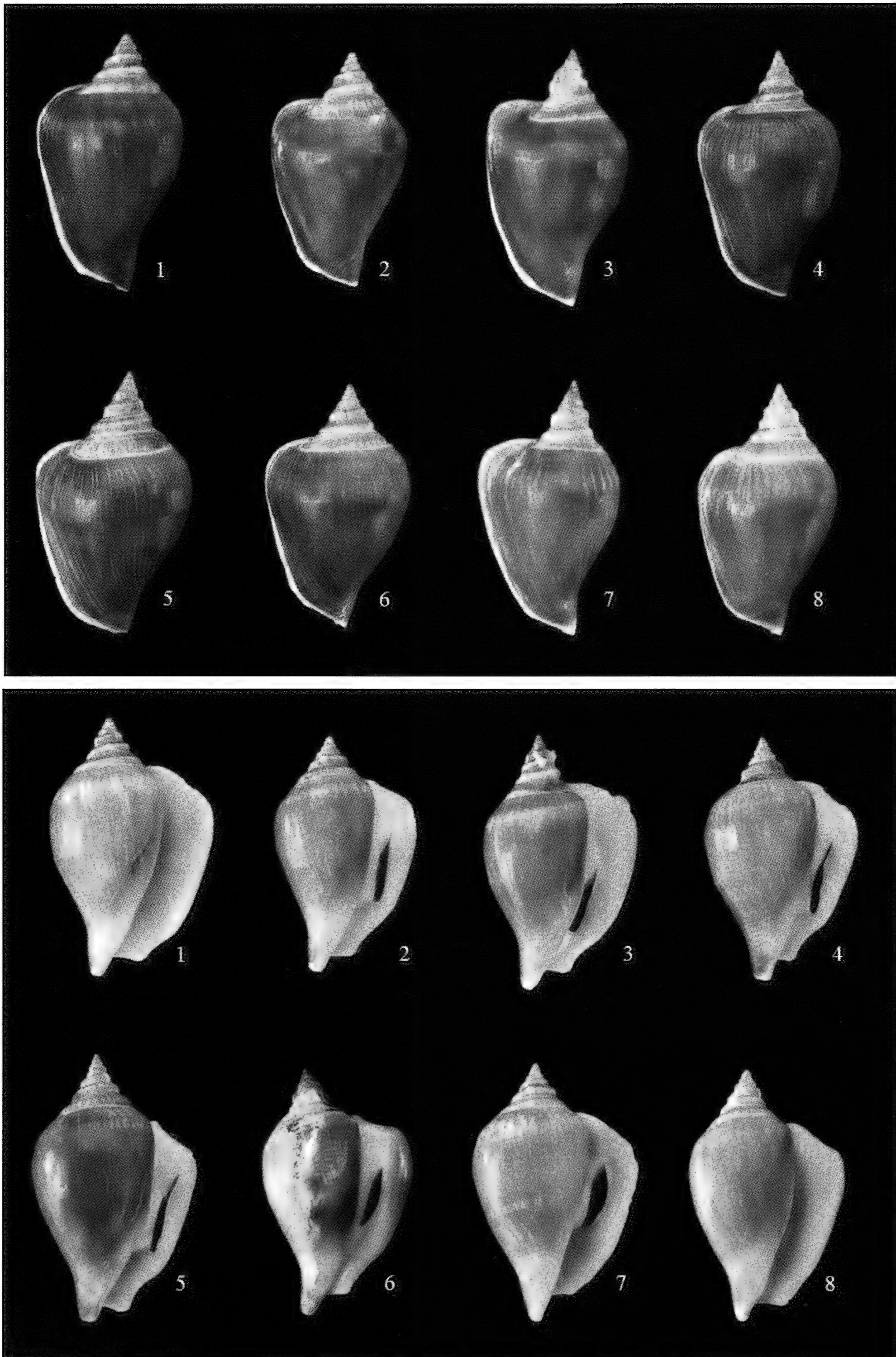


Plate 8. *Laevistrombus (Gonggongus) turturella* (Röding, 1798) (Synonym *L. isabella* Lamarck, 1822) (extreme south Thailand, Andaman Sea). All 8 specimens are from Chorchat Gra-tes Shell Collections. Size from Fig. 1 to Fig. 8 are 67.8 mm, 63.8 mm, 64.4 mm, 68.8 mm, 66.8 mm, 66.8 mm, 71.0 mm and 70.8 mm respectively.

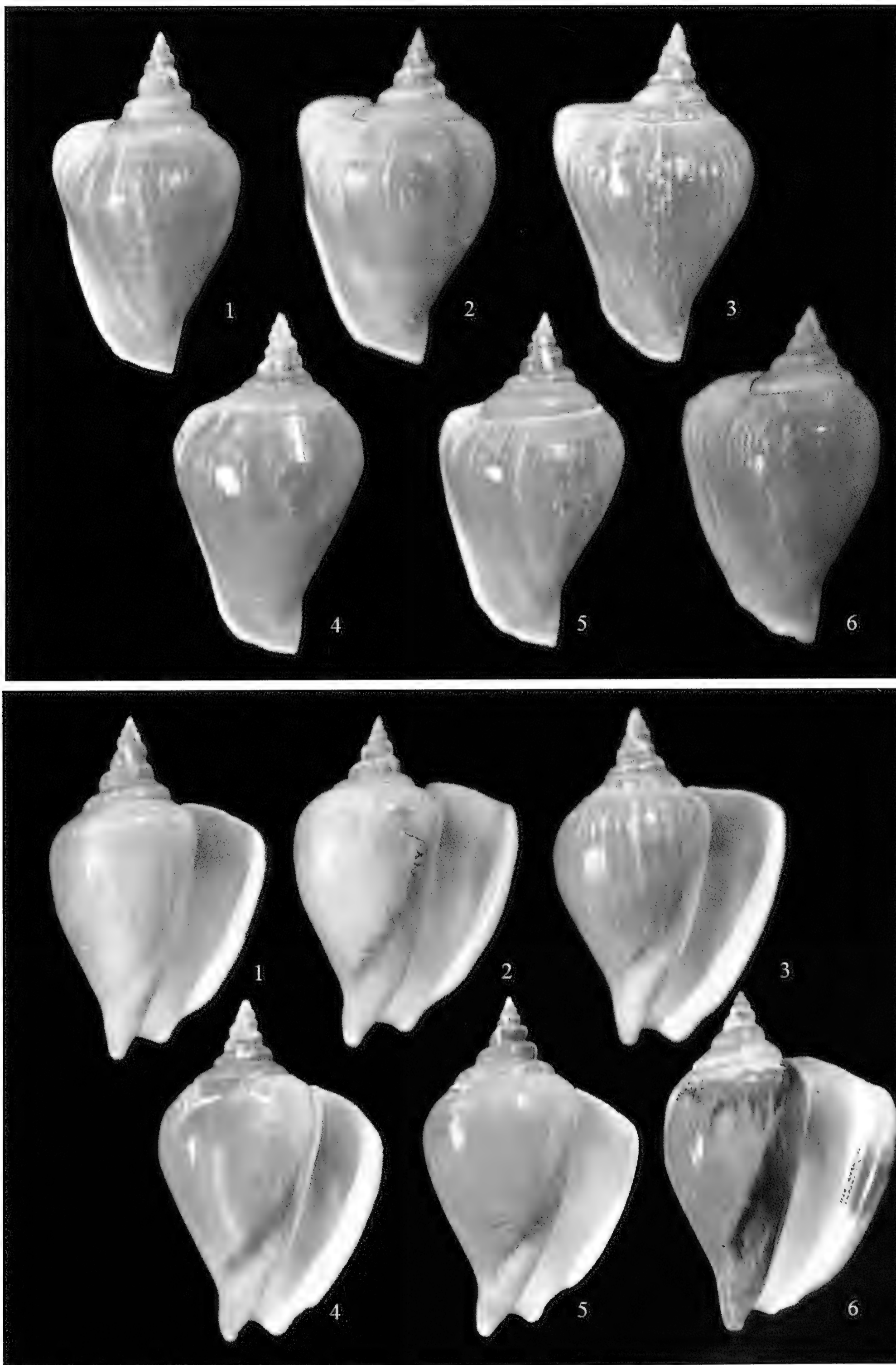


Plate 9. *Laevistrombus (Gonggongus) turturella* (Röding, 1798) (Philippines). All 6 specimens are from Chorchat Gra-tes Shell Collections. Size from Fig. 1 to Fig. 6 are 103.0 mm, 101.2 mm, 99.6 mm, 109.2 mm, 104.8 mm and 98.0mm respectively.

A new subspecies of *Amphidromus palaceus* (Mousson, 1849) from Sukabumi Regency, West Java, Indonesia

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ABSTRACT This paper describes a new subspecies of *Amphidromus palaceus* (Mousson 1849b) from Nyalindung, West Java, Indonesia. Both subspecies have a similar animal coloration and produce dextral or sinistral shells. The shell of the new subspecies differs from nominotypical *A. palaceus* by having pale-colored stripes marking resting stages, lack of brown subsutural spots or blotches and the presence of a smoother sculpture, less recurved lip margin and thicker white parietal callus.

KEY WORDS *Amphidromus*, *palaceus*, *nyalindungensis*, Nyalindung, Sukabumi Regency, Java, Indonesia, new subspecies

INTRODUCTION

Late in 2020, the second author (JA) received images of shells from a colleague (PHA) in Nyalindung, West Java, which looked like *Amphidromus palaceus* (Mousson 1849b), but the shells have a much smoother surface. A search of the literature failed to uncover any record of that species found in the vicinity. Dharma (2007) cited the nearest localities where *A. palaceus* lives, all near Sukabumi City, West Java Province: 1) Baru Benteng, Karawang, 2) Gunung Guruh and 3) Situ Gunung, Cisaat. Shells from these locations were unavailable for comparison.

COVID-19 restrictions delayed receipt of the shells from Nyalindung until May 2021. We then fruitlessly searched the literature for a published name given to similar shells as a variety, subspecies or species. A review of images on the BioPortal website for the Naturalis Biodiversity Center, known for its images of Indonesian shells, and the Global Biodiversity Information Facility (GBIF)

website found nothing we considered as a close match to the original published images of *A. palaceus* or our new Nyalindung material. It was not until December 2021 before PHA, who discovered the colony, allowed John to collect and photograph live snails on his property. Based on a similarity of the animal coloration and differences in resting stage markings, lack of brown subsutural spots or blotches, sculpture, parietal callus and other subtle features, we herein described the Nyalindung snails as a new subspecies of *A. palaceus*.

Materials and Methods

Three shells make up the type series, the holotype (MNHN) and two paratypes (JAC) and comparative material comprised of shells from one private collection (JPC ex-JAC).

Abbreviations used for museums and private collections:

JAC:	John Abbas collection
JPC:	Jeff Parsons collection
MN:	Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity, Berlin, Germany
MNHN:	Muséum national d'Histoire naturelle, Paris, France
SMF:	Senckenberg Naturmuseum, Frankfurt, Germany
ZMUZH	Zoologisches Museum der Universität Zurich, Zurich, Switzerland

Abbreviations for shell morphometry and other:

D:	shell width (abbreviation for 'diameter' as per literature usage)
H:	shell height
H/D:	shell height/shell width ratio
JA	John Abbas
JP:	comments, data, images, observations or other by Jeff Parsons
N:	whorl count
PHA	Pak Haji Ali, a colleague from Nyalindung
W:	shell weight

Shells were measured using digital Vernier callipers (0.01 mm resolution), examined under low magnification (10x) using a jeweller's loupe for surface detail, and weighed using a pocket-sized electronic scale (capacity 300 g x 0.01 g). Whorl count included the apex and with a precision of ± 0.125 . 'Paries' (adj. parietal) refers to the inner apertural wall and 'palatum' (adj. palatal) is the outer apertural wall. Relative shell sizes for *Amphidromus*: small < 40 mm, medium 40-60 mm, and large > 60 mm.

A search of the relevant literature and museum websites (MHNG, MN, SMF, ZMUZH) did not locate Mousson's type material of *A. palaceus* collected by Zollinger, or candidate specimens previously owned by von dem Busch, or L. Pfeiffer. Therefore, we chose five adult shells from Pangandaran Bay, West Java matching the species description to use in this study. A comparison with those shells and details from the literature found the Nyalindung material to be easily separable from *A. palaceus*. The description and variation of the new subspecies were determined from empty shells obtained by

PHA. Photography credits are as indicated below figures and the plate.

Taxonomic and nomenclatural remarks

Amphidromus palaceus (Mousson 1849b)

The authors consulted the pre-1860 works of Pfeiffer (1848 and 1850) and Mousson (1849a, 1849b and 1850) to have a better appreciation of the original concept of this species. Both Pfeiffer and Mousson placed it in the *Amphidromus perversus* (Linnaeus, 1767) group.

Synonymy

Bulimus palaceus von dem Busch in litt. listed as a synonym of *Bulimus perversus* var. *ι* [iota] Pfeiffer, 1848 (p. 39)

Bulimus palaceus von dem Busch in Mousson 1849a ['1848'] (p. 266) nomen nudum

Bulimus palaceus von dem Busch in Mousson 1849b (p. 28 and 108; pl. 3, fig.1)

Remarks. Pfeiffer (1848) referenced a letter from von dem Busch as the first usage of the name *Bulimus palaceus*. The current Code (ICZN 1999) does not consider that a published

work, even if the letter contained a description or definition; therefore the name is not accredited to von dem Busch. One could argue that Pfeiffer's "very brief" definition to distinguish the shell from other varieties of *B. perversus* satisfies Article 12.1 (ICZN 1999). However, he clearly treated the shell studied as a variety (var. *ι*) of *B. perversus*, and since the Code (ICZN 1999) does not cover varietal names, that means *B. palaceus* is not available from this work. Although Mousson (1849b) accredited the name of *B. palaceus* to von dem Busch, the text indicates that Mousson provided the description and figures, and thus made the name available with sole authorship given to Mousson.

SYSTEMATICS

Family Camaenidae Pilsbry 1895

Genus and Subgenus *Amphidromus* (masc.)
Albers 1850

Type species *Helix perversa* (fem.) Linnaeus
1758

Amphidromus palaceus nyalindungensis
Parsons and Abbas new subspecies
Figures 1, 2, 3A-3D, 3I and 3J

Description. Shell medium-sized, sinistral, conic-ovate in shape, thick and quite solid, weakly translucent. Spire moderately long with a flattened profile and blunt apex, not protruding (chipped); protoconch surface worn smooth. Teleoconch surface somewhat smooth, glossy; spiral striations very fine on lower spire, faint on last whorl and worn apically, overlain by growth lines and threads on the upper whorls. Last two whorls pliculate with interstitial growth lines and threads; the pliculae are coarser on the base versus weaker and flatter on the upper surface. Tips of pliculae weakened

before reaching the sutural margin and tips of growth threads puckered just below it.

Whorls 6½, convex apically and following ones flatly convex. Last whorl not inflated, convex above and below the obsoletely sub-angular periphery, noticeable next to the aperture, and last quarter slightly descending. Suture impressed, somewhat deep apically and with a sub-irregular margin on lower whorls, which is weakly or not affected by transverse sculpture. Subsutural region not sub-compressed. Periostracum isabelline colored, present as a trace near the aperture and preserved below the parietal callus. Shell plain except for an opaque white infrasutural fillet, more distinct on upper whorls, and three faint whitish stripes marking growth stoppages (morae; Parsons, 2014) on the last whorl, seen more clearly in transmitted light and each bordered by a grey resting line. Apex creamy (chipped) and lower whorls pale cream buff, greyed on spire.

Aperture moderately large, sub-elliptical, and oblique both ventrally and laterally. Palatal surface faintly whitened, and the external color shows through under strong light (as in Figure 1). Parietal callus a thin colorless film internally, allowing the underlying preserved isabelline periostracum to show through it. Outer parietal margin bordered by a translucent white zone and thickened outwardly to form a slightly raised edge in the middle. Posterior parietal tubercle sub-triangular and connected to lip terminus; anterior tubercle falcate and extends from the columellar margin; both tubercles white and barely distinguishable from the white callus connecting them. Outer lip white, strongly reflected, expanded throughout and thick; lip terminus distinctly elevated; lip face flat, lateral profile subconvex and edge slightly recurved to form a thick, low rim. Columella white, moderately wide, straight and sub-vertical; its margin cuneate, flatly dilated and

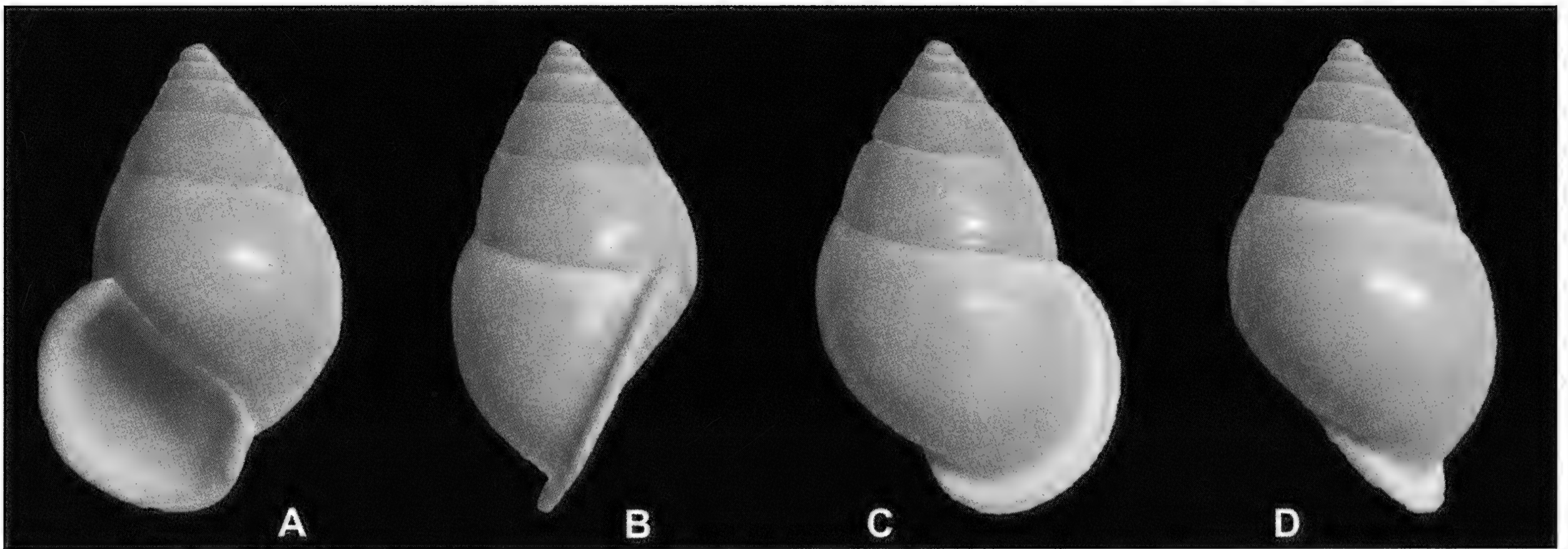


Figure 1. Holotype of *A. (A.) palaceus nyalindungensis* n. ssp. [photos by JP].

thick, with a secondary thick ridge formed beside its edge. Umbilicus rimate and lacks a whitish zone around the columella.

Type Material. Three adult shells collected at the type locality, collected by PHA. Holotype: sinistral shell (MNHN-IM-2000-38515, Figures 1, 3I and 3J), H 41.07 mm, D 26.82 mm, H/D 1.53, N 6.5 and W 3.80 g. Paratypes: 2 sinistral shells (JAC, unnumbered, Figure 3A, B), H 41.75-44.96 mm, D 25.56-27.23 mm, H/D 1.53-1.69, N 6.125-6.375 and W 2.80-3.47 g.

Other Material Examined. Two adult shells from the type locality, 1 sinistral and 1 dextral, collected by PHA (JPC, Figure 3C, D), H 40.10-41.76 mm, D 26.14-26.29 mm, H/D 1.53-1.60, N 6.0-6.125 and W 2.21-3.03 g.

Type locality. Mountain slopes east of Nyalindung at 1,040 m altitude, Nyalindung District, Sukabumi Regency, West Java Province, Indonesia.

Distribution. Currently known only from the type locality.

Ecology/Habitat. Moist evergreen hill forests.

External animal coloration. Head, neck and flanks are light to pale grey; postero-dorsum (dorsal area behind the neck) off-white to pale grey (paler than flanks). Upper and lower tentacles are grey, their tips and eyes zinc orange; pigment-patch on top of the head and nape (cephalo-nuchal patch), mantle, tail and foot pale cream to buff; mantle collar dull greenish black and sole amber yellow. All upper surfaces sprinkled with paler granules, except for the tentacles [Figure 2].

Soft parts. Not available for study.

Etymology. Named after Nyalindung District with the Latin suffix -ensis meaning “of or from”.

Shell variation of the new subspecies.

All shells studied are medium sized; a little thin to thick, somewhat solid to quite solid and strongly to weakly translucent. Of eleven specimens, (five empty shells and six live snails), seven are “whitish” and four yellow with two dextral and nine sinistral, suggesting dextral specimens are uncommon. Shell shape is

narrow to wide with H/D ratios ranging from 1.53 to 1.69 and ovate-conical to high conical or oblong-ovate. The moderately long, conical spire has a flattened or slightly convex profile with a spire angle of about 59-66°. Protoconch is obtuse-conical with an obtuse and somewhat protruding apex on most shells, damaged on the holotype. The shell surface is glossy and somewhat smooth with the sculpture as per the holotype or less flattened pliculae on the upper surface, which first appear on the antepenultimate whorl (Figure 3A). Spiral striations are as on the holotype or fine (slightly coarser) on most of the post-apical spire whorls and base, obsolete on the upper surface of the last whorl.

Teleoconch whorls are flattened (flatly convex) on the entire spire or flattened on the upper

spire and subconvex on the penultimate. The last whorl convex and not inflated, sometimes slightly descending in front and the periphery rounded throughout (Figure 3B), obsolete sub-angular (Figure 3I) or sub-rounded next to the aperture (Figure 3A, 3C and 3D). The base is convex, not tapered. Sutural margin is sub-irregular due to the tips of pliculae weakened before reaching its edge and the tips of growth threads puckered just below it. Suture bordered below by an opaque white or albous (dull white) infrasutural fillet. Subsutural region not compressed and without brown subsutural spots or blotches. Of five shells, faint whitish morae or growth stoppage stripes only seen on the holotype (Figures 1C-1D).

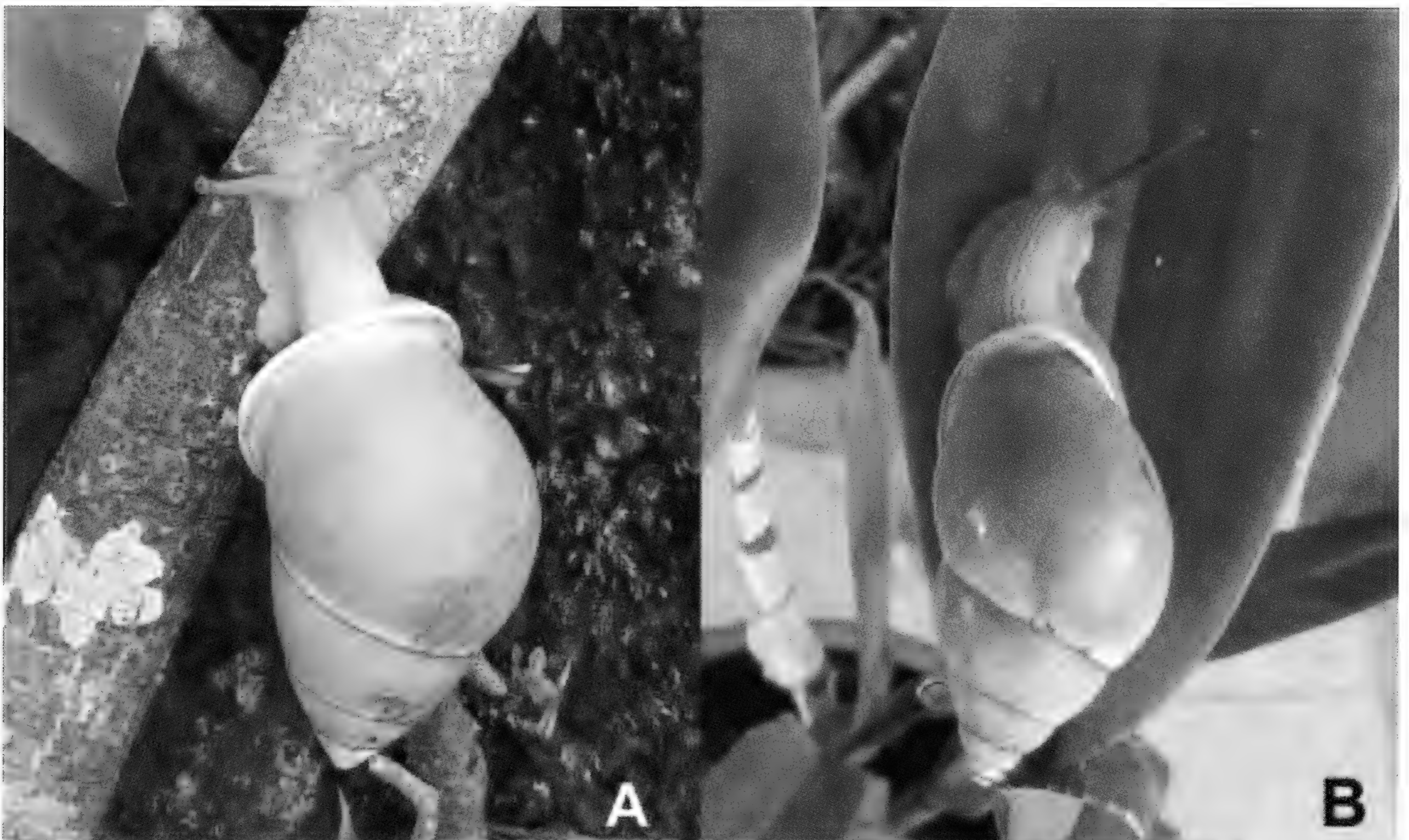


Figure 2. Live *A. (A.) palaceus nyalindungensis* n. ssp. showing variation in animal coloration due to lighting conditions: **A**= lit by dim sunlight versus **B**= shaded [photos by JA].

The lip, columella, paries and palatum have a shiny lustre or it is dull due to some post-mortem degradation of the surface. The aperture obliqueness, shape and size are similar for all five shells studied, although the base is effuse on one shell due to a growth error behind the lip (Figure 3A). The umbilicus is widely rimate or ovately perforated and small relative to the shell width. Two shells have a whitish zone around the columella, seen as a small whitish patch near the umbilicus (specimen shell 2 and paratype 1). Shells have a strongly to weakly translucent palatum, its surface is whitened faintly on “whitish” shells and very faintly on yellow shells, allowing the external colour to show through under strong illumination (as in Figure 3A-3D).

The parietal callus is a colourless film internally, allowing the colour of the previous whorl's surface or preserved periostracum below it to show through, or partially whitened due to post-mortem degradation. The translucent white zone at the parietal margin is about 3 mm wide medially and thickened outwardly so that the edge is slightly raised in the middle (Figure 3I), slightly thicker (Figure 3D) or much thinner with a colourless central area on a less mature shell (Figure 3C). Parietal tubercles shaped as per holotype, variously thickened and indistinguishable from the connecting white callus on most shells, except on one shell with a poorly developed marginal callus (Figure 3C).

Outer lip is expanded throughout, 2.01*-3.73[#] mm wide ([#]holotype and *specimen shell 1 with a less developed lip) and 1.02-1.27* mm thick, including the recurved edge (*holotype). The lip face is flat or sub-rounded, and the lateral profile is straight, curved outward or sub-sinuuous (result of a growth flaw; Figure 3A). Outer lip terminus is barely to distinctly ascending. Outer lip's edge is slightly recurved and forms a thick, low rim about 1 mm thick, or

a narrower and lower rim, except near the umbilicus (paratype 2). Columella is moderately wide (2.60-2.84 mm), vertical or sub-vertical and straight. Columellar margin is cuneate, 3.22-4.32 mm wide and 1.02-1.18 mm thick (four shells), except very thick on the holotype (1.64 mm, excluding its thick ridge), and convexly dilated above the umbilicus or flat (holotype). Only the holotype has a secondary thick ridge formed beside along the columellar margin's edge, (about 1.5 mm wide).

The three “whitish” shells have an isabelline periostracum (pale brownish yellow) with h more of it preserved on the dextral shell; hence, it has more of a brownish tinge (Figure 3D). The protoconch is greyish or coloured as per the last whorl, except a darker tone (Figure 3D) and has a creamy apex. The last whorl is actually creamy white (Figure 3B), cream (Figure 3D) or as pale cream buff (Figure 3I) and slightly greyed on the spire. Internal parietal colour is isabelline due to preserved periostracum below the colourless interior part of the parietal callus.

The periostracum on the yellow shells is very slightly darker than the ground colour and is invisible except for some blistering on the last whorl; the apex is albous or greyed, and the protoconch is a slightly darker yellow than on the spire. Ground colour is wax yellow and the same tone of yellow throughout (Figure 3A) or citron yellow with slightly greyed early whorls on a thinner shell (Figure 3C). Internal parietal colour is the same tone as the external surface beside the parietal margin or slightly darker. Whether the difference in apical colour between the creamy and yellow shells is the same for the whole population is unknown.

The shell colour of live snails is influenced by their food and two distinct colorations observed. The “whitish” shells have a bluish-green appearance (pale bluish glaucous to turquoise

green, e.g., Figure 2B) and the yellow shells have a slight greenish tinge (pale greenish yellow to viridine yellow, e.g., Figure 2A). In terms of animal coloration variation, the foot on one snail was amber yellow with a pale cream margin. This darker coloration is possibly due to greater moisture absorbed post-collection relative to its neighbours.

DIFFERENTIAL DIAGNOSIS

The following differential diagnosis uses five shells of *A. p. palaceus* (data below) chosen for their similarity to the original figures in Mousson (1849b) and supplemented with details from the literature.

Nominotypical subspecies. Five adult shells from Pangandaran Bay, West Java, 4 sinistral and 1 dextral (JPC, Figure 3D-3H, 3K and 3L): H 47.00-53.66 mm, D 27.50-32.12 mm, H/D 1.59-1.84, N 5.75-6.625, and W 2.93-5.23 g.

Distribution. Banten, West Java, and Central Java Provinces (van Benthem Jutting 1950)

In general, *A. p. nyalindungensis* differs from *A. p. palaceus* by having a smoother sculpture, the presence of pale-coloured morae (varices of authors) and the lack of brown subsutural spots or blotches. It also differs in the lip margin being less recurved, and the parietal margin has stronger parietal tubercles connected by a thicker white callus with a raised edge at maturity. The protoconch is 0.03 to 0.5 mm smaller than the protoconch on shells of *A. p. palaceus* that are 2.5 to 13.7 mm larger (five shells JPC).

In contrast, shells of *A. p. palaceus* commonly have translucent to opaque, brown to black morae, 1 to 3 in number, sometimes more or absent. They are often solitary on the penultimate or last whorl and may form pairs or

groups on the last whorl with some pairs separated only by a hairline gap. The colour is uniform, inconsistent (pale and dark sections) or faint and vestigial; sometimes with a darker or paler border and may be connected to one of the brown spots or blotches below the suture.

The parietal margin of *A. p. palaceus* is white callused like that of *A. p. nyalindungensis*, except it forms a narrower white zone, only a white cord of callus along the border or it is absent. The parietal tubercles are thinner, similarly shaped and often undeveloped as smudges of white callus on shells without a white marginal zone (Figure 3C). In terms of the parietal callus, Dharma (2007) described the thickened parietal margin and tubercles as "...sometimes thickened white at (its) two ends and margin." Periostracum absent on the shells of *A. p. palaceus* studied, all denuded.

The outer lip of *A. p. palaceus*▲ is relatively narrower than that of the smaller shells of the new subspecies* (2.48-2.89▲ mm vs. 2.01-3.73* mm) and appears thicker (1.60-2.30▲ mm vs. 1.02-1.29* mm) due to the more recurved margin, up to two thirds of the lip width (i.e. wider). It has an outwardly curved lateral profile and rounded lip face, compared to that of the new subspecies, which also has a straight lateral profile and flat or sub-rounded lip face. Shell surface of *A. p. palaceus* differs in being less polished (shiny) and rougher with plicae on the last two whorls, sometimes coarser on the base and has fewer interstitial growth lines and threads on the last whorl than on the penultimate whorl. Remainder of the spire as per the new subspecies or worn, and the spiral striations are faint and very fine or obsolete.

The shell of *A. p. palaceus* is strongly to moderately translucent, and the conical spire has an unflattened profile with a lower spire angle of about 55-61°. Whereas *A. p.*

nyalindungensis has a strongly to weakly translucent shell, sometimes its spire has a flattened profile and a spire angle of about 59-66°. Whorl convexity constant or reduced anteriorly and generally subconvex on the teleoconch, except with some lateral compression on oblong shells, on the contrary *A. p. nyalindungensis* whorl convexity increases anteriorly with a flattened upper teleoconch. The last whorl differs from that of the new subspecies in occasionally being somewhat inflated and the periphery on the shells studied is not obsoletely sub-angular.

“Whitish” shells of *A. p. palaceus* differ from those of the new subspecies in being grey-tinted and not cream-tinted, slightly greyed on the lower whorls and darker tinted on the upper spire, and the apex is white, never creamy. Other shells of *A. p. palaceus* have the same hue (yellow or other colour) on the teleoconch whorls or have darker upper whorls (Pilsbry 1900; van Benthem Jutting 1950; Dharma 2007). The yellow is variable and of different tints or tones than yellow shells of *A. p. nyalindungensis*, clear (e.g. lemon yellow or canary yellow) or with a brownish tint (e.g. buff yellow).

Amphidromus p. palaceus generally has a weakly impressed suture on the last two whorls, compared to an impressed suture on *A. p. nyalindungensis*, or it sometimes briefly appressed near flaws. The subsutural region may be non-compressed like that of the new subspecies, briefly flattened or weakly compressed. The sutural margin differs from that of the new subspecies in being subcrenulated by the tips of plicae and growth threads, and the infrasutural fillet sometimes partially replaced by a brown or reddish (rufous) band on the fourth whorl or several early whorls (Pilsbry 1900; van Benthem Jutting 1950).

Unlike the “whitish” shells of *A. p. nyalindungensis*, there is no periostracum preserved below the parietal callus and the aperture of *A. p. palaceus* is a little less rounded and ovate or oblong-semielliptical. Shells of *A. p. palaceus* also differ in having the paries of the same hue as per the exterior or slightly darker; the columella is sometimes slightly twisted, and the columellar margin not occasionally flattened. The whitish zone around the columella seen on some shells of *A. p. nyalindungensis* is absent, and whitening seen near the umbilicus on some yellow shells of *A. p. palaceus* is due to post-mortem degradation or discoloration. Although the shells of *A. p. palaceus* studied are larger, both subspecies have very similar dimensions for the umbilicus, columella, columellar margin and aperture, and this means these characters are relatively larger or wider on the new subspecies for the same sized shell.

Final comments

Based on the eleven specimens of *A. p. nyalindungensis* studied, only the holotype has whitish morae marking growth stoppages and all lack brown subsutural spots or blotches, both of which are brown to black and often present on *A. p. palaceus*. This suggests that *A. p. nyalindungensis* lacks the ability to produce melanin pigments. However, it has a dull greenish black mantle collar and both pairs of tentacles are grey, meaning eumelanin is present in those parts of the animal. The “whitish” shells have cream-tinted lower whorls and an isabelline periostracum, which indicates the presence of yellow phaeomelanin. The only explanation left is that the mantle of the new subspecies does use melanin while forming the shell layers, thus making only whitish morae and it simply does not produce subsutural spots or blotches. The “whitish” shells have a trace or minor amount of yellow phaeomelanin resulting

in a creamy tint and so best described as an “isabelline” morph, which lack red phaeomelanin and would be a flesh-coloured morph if present. Such pale pinkish-brown shells are sometimes seen in *A. p. palaceus* (e.g., Plate 10, figures 2 and 5 in Dharma, 2007), unless their pinkish tint is due to another pigment. The absence of true “white” shells of *A. p. nyalindungensis*. suggests that the yellow shells are an albinistic morph due to a lack of both melanins in the shell layers.

ACKNOWLEDGMENTS

We thank Pak Haji Ali for sending the type specimens of this new subspecies to John and giving him permission to visit the location to collect and photograph live snails. We also give thanks to Virginie Héros, Chargée de conservation collection Mollusques (MNHN) for assistance in depositing the holotype.

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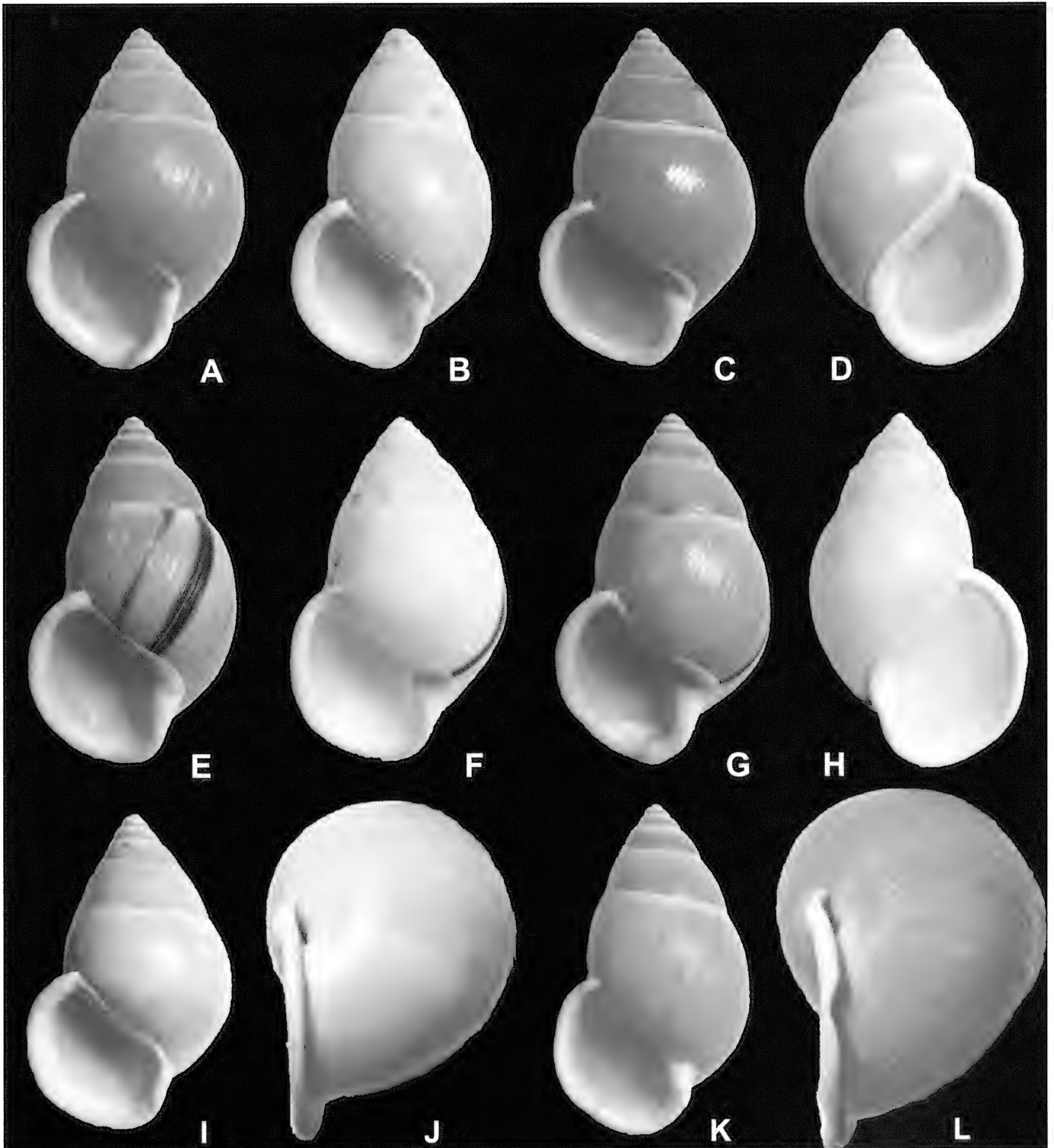


Figure 3. Comparison and contrast between both subspecies of *A. (A.) palaceus*. **A-D**= *A. (A.) p. nyalindungensis* n. ssp. **A**= Paratype 1 (JA), **B**= Paratype 2 (JA), and **C, D**= specimen shells (JP). **E-H**= *A. (A.) p. palaceus* specimen shells (JP). **I-L**= comparison of shell sculpture for both subspecies using ventral and umbilical views: **I, J**= *A. (A.) p. nyalindungensis* n. ssp. of the Holotype, and **K, L**= *A. (A.) p. palaceus* specimen shell (JP). [Shells shown at approximately the same scale within each row; and image credits: **A-L** JP.]



Have a shell collection you would like to donate to The San Diego Shell Club?

The San Diego Shell Club is interested in your shell collection. As a 501c(3) organization, all donations to our Club may provide a tax write-off. When we receive a donation we provide a letter describing the items that may be used when filing your taxes. While we cannot provide a value, donations of up to \$5,000 do not require a written appraisal. Since tax laws change regularly we recommend that you check with your tax accountant before relying on any information provided here.

We are interested in all types of shells, marine or land and all genera and species, including books on shells as well as items related to shells such as artwork, storage cases and tools. Your donated items will be used to generate income to support the Club's efforts in continuing Public education about shells and conservation of marine life throughout the world. If you would like to donate, please contact David Waller, SDSC Acquisition Chairperson, by email at dwaller@dbwipmg.com to schedule a time to discuss charitable gifting.

CLUB NEWS

2022 August - West Coast Shell Show

The Club's annual West Coast Shell Show in Balboa Park proceeded on August 25, 2022, after two years' absence due to Covid-19. The Annual West Coast Shell Show was held in Balboa Park (San Diego, California) in August. The display judges this year were John "Duffy" Daughenbaugh and Paul Tuskes. There were approximately twelve competitive displays which included marine, aquatic, and terrestrial mollusks. The vendors and visitors enjoyed swapping shell and travel stories. The Club gave packages of shells and shell books to children.

September 2022 - September Party

There was no September party this year.

October 2022 - General Meeting

The Club's October General Meeting featured a presentation by Lindsey Groves of the Natural History Museum of Los Angeles County on "Fossil and Recent Cypraeidae and Eocypraeidae in California, USA: From the Early Cretaceous through Holocene, an Update." Since the Early Cretaceous there have been at least 23 species of fossil and recent Cypraeidae and Eocypraeidae described from what is now California. Fourteen species are cypraeids and nine are eocypraeids. At the moment there are three new species in a draft manuscript, two cypraeid species and one eocypraeid species, which will bring the total to 26 species. However, based on poor preservation of type material of three previously described species, those these species will likely be relegated to *nomina dubia* status (*i.e.*, a name that is of unknown or doubtful application). There are also numerous specimens of unknown affinity due to poor preservation. A link to the presentation is: https://us02web.zoom.us/rec/play/WmUCExIPu_-F5kLRVVqFv9UqNrx9B-KddJHGrCDNs56b1dvwnQcknBpMSYZukk0J6LPhzNoM_AocXT7L.EMQfUD_wRaF0voC7?continueMode=true

Editor's Corner

Stephen J. Maxwell, Associate Editor

The President of the United States recently required all US-funded research to be made open access. While this decision will allow many to access articles that have been behind paywalls to be made free to the public, the downside lays with the authors of those articles who do not have research or private funds to pay the fees which many journals charge for this service. In the case of the journal Nature, very few people understand that it costs \$11,000 to publish an article, or that Zookeys charges €780. This is out of the reach of most academics. I am pleased to say that The Festivus has no such charges.

Authors also have institutional requirements for their articles, and if The Festivus is to attract greater submissions then the journal needs to meet two key indexing requirements. The first is the provision of a Digital Object Identifier ("DOI"), which is a string of numbers and letters that is attached to an article that allows that article to be linked to a website, as well as, provides the basis for tracking its use as a reference and linked in global databases. This year, The Festivus achieved recognition within the CrossRef system, and this enabled each article to be issued with a unique DOI.

The second is achieving an Impact Factor ("IF") score; this score rates the journal's impact based on citation rates. Authors from institutions are required to publish in journals with Impact Factors, often seen as a universal mark of quality assurance in the journal publishing. Historically, the lack of an Impact Factor has meant that The Festivus is not on "the radar" of many authors for this reason. This year, The Festivus successfully applied to be granted an Impact Factor, which will be issued after twelve months of registration. This registration process required that The Festivus meet a series of rigorous quality controls measures. These ranged from an independent assessment of the quality of the journal by an independent board of scientists, of which The Festivus was not made aware of who was assessing them, through to the archiving and frequency of the journal. This was not an easy process, and the editors had to ensure that the ethics and standing of the journal the integrity of the peer review process, was of a standard at least equal to the top journals in the world. This process of assessment took three months to complete, and within the next year The Festivus will be issued with an Impact Factor score.

As we move forward, now that the two main goals of DOI and Impact Factor recognition have been achieved, the editors will endeavour to increase the exposure and appeal of the journal by applying to many abstract indexing services that are now operating. This will further add to the appeal within the wider academic community and draw in more quality articles in the future. However, this will present challenges going forward, particularly to the page limitations and frequency of the journal, something that will need to be addressed in the coming years.

At present, The Festivus is the last pure malacological journal standing in the United States that publishes with regularity. The Club therefore has a great responsibility, which it is currently rising to meet. Members should be proud of this journal's growing tradition and importance to the wider malacological community it is achieving.

Female Eponyms of Molluscan Genera and Species Names, Alaska to Baja California

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I have been working for some time on a project identifying individuals honored in the names of marine mollusks found from Alaska to Isla Cedros, Baja California. The list of such terms includes 808 scientific names representing all, or nearly all, eponymous molluscan genera and species (excluding Cephalopoda) occurring from the Arctic to Mexico. The names I have researched commemorate gods and goddesses, sea captains, conchologists, malacologists, explorers, fishermen, botanists, ornithologists, ethnic groups, wives, children, institutions, ships, seals, and even a cat.

Of the 808 eponymous names of mollusks included in my study, 14 taxa (1.73%) are named for non-human subjects (such as *Doto kya* Er. Marcus, 1961, named for a folklore seal) or ethnic and cultural groups (e.g., *Okenia cochimi* Gosliner & Bertsch, 2004, honoring an indigenous people who once inhabited a major part of the central Baja California Peninsula). Including four species named for both a husband and wife (shown with asterisks in Table 1), a total of 627 (77.60%) names honor real-life males living from the eighteenth century, the era of Linnaeus' introduction of binomial nomenclature, to today. Another 38 (4.70%) taxa are named after gods, heroes, or other masculine figures from primarily Greek and Roman mythology and classical literature. Among genera and species named for females, 43 (5.32%) are named for goddesses, nymphs, muses, and other feminine entities, also primarily from Greek and Roman mythology and literature. A total of 91 taxa (11.26%), including the four named for a husband and wife, honor actual women living from the eighteenth century to the present day.

The preponderance of genera and species among the reviewed taxa named for males is unmistakably large when compared to the number named for females, but it is not surprising. The overwhelming prevalence of scientific terms named for men, versus the number named for women, is widely recognized in nearly every scientific field (Stigler, 1980; Fargen and Hoh, 2014; Van Tassel et al., 2018; Heard, 2020). And though usefulness, accuracy, and fairness in the practice of eponyms are a subject of debate within multiple scientific communities today (Stigler, 1980; Fargen and Hoh, 2014; Heard, 2020; Pulido and Matteson, 2010; Van Tassel et al., 2018; Musso, 2019), the long history and common use of eponyms make it unlikely that they will disappear any time soon from scientific vocabulary (DiPoce et al., 2014; Zeng and Gold, 2020).

Despite the significance of this subject, it is not my intention here to address the gender imbalance that for an immense variety of reasons undoubtedly exists in malacological nomenclature. Rather, my object is to share what I have found about some of the individuals honored among 91 molluscan taxa named for actual women living during the past four hundred years. My intention is to emphasize the number, identities, and variety of women honored among a selected group of molluscan taxa and to give some idea of the presence such figures have in the history of malacology.

Methodology

This study examines female eponyms of marine molluscan genera and species, omitting Cephalopoda, found from Alaska to Isla Cedros, Baja California. Eponyms referring to female mythological or fictional characters are omitted, as is the exceptional pre-eighteenth-century real-person example of *Odostomia hypatia* Dall & Bartsch, 1912, named after the female mathematician and astronomer Hypatia of Alexandria (370-415 CE). The aforementioned four taxa named for wives and their husbands (Table 1) are replicated in the separate totals for both men and women living from the eighteenth century to today. *Knoutsodonta jannae* (Millen, 1987), named after both a modern female and Roman mythology's two-faced god of beginnings and transitions, Janus, has been included in the totals for the respective categories of each subject. Birth and death dates of individuals discussed herein are given when known.

Conchologists, Malacologists, and Others

The contributions to malacology by the women discussed herein range from minor to major and from the concrete to the inspirational. Perhaps not unexpectedly, a majority of eponyms in the selected group commemorate female conchologists, malacologists, or marine scientists, with several individuals represented more than once.

As shown in Table 1, the name of Stanford University malacologist A. Myra Keen (1905-1986) (Figure 1) appears most often—once each as *Keenaea*, *Keenocardium*, *myrae*, or *myrakeenae*, and four times as *keenae*. Keen was widely known as "the First Lady of Malacology" because of her exemplary scientific standards and diverse expertise regarding mollusks. An expert on the systematics of Cenozoic mollusks, she described dozens of new species and published on a wide range of malacological subjects. Keen's *Sea Shells of Tropical West America* (1958, 1971) is still a major reference work.

Another well-known name in malacology is that of Ida Shepard Oldroyd (1856-1940), named in the epithets *idae* (two species), *oldroydae* (three species), and *shepardiana* (Table 1). She and her husband Tom Shaw Oldroyd (1853-1932) (Figure 2) were avid shell collectors who discovered many new species, several of which William Healey Dall and Paul Bartsch described and named after them. Ida Oldroyd was founding vice president of the American Malacological Union (now the American Malacological Society) in 1931 and served from 1917-1940 as Curator of Conchology at Stanford University. She published 17 papers on mollusks and other marine species and described some 35 mollusks, nine of which are still accepted (WoRMS, 2022). She was also author of *Marine Shells of Puget Sound and Vicinity* (1924) and *The Marine Shells of the West Coast of North America* (2 vols., 1925-1927).

Several epithets in Table I refer to Jeanette M. Cooke (1843-1920), a knowledgeable conchologist and co-owner of the World Shell and Curio Company in San Diego, California. William Healey Dall paid Cooke a home visit while he was touring California in the summer of 1911, later describing her as "a most assiduous collector" (Dall, 1917: 475). He named *Macrarene cookeana* (Dall, 1918) and *Epitonium cookeanum* Dall, 1917, in her honor. Paul Bartsch also named *Odostomia cookeana*

Bartsch, 1910, and *Turbonilla cookeana* Bartsch, 1912, after her. At her death, Cooke's collection of some 2,500 land, freshwater, and marine shells was donated to the local Theosophical Society and Universal Brotherhood, of which she was a member. The collection was later purchased in 1931 by Long Beach, California, conchologist Herbert N. Lowe (1880-1936).

Katherine "Kate" Stephens (1853-1954) (Figure 3) was a self-taught expert on mollusks and fossils. Born in England, she worked for a time at the British Museum of Natural History before moving to San Diego, California, where she taught school, collected and became a local expert on terrestrial and marine mollusks, and in 1898 met her future husband, pioneer bird and mammal collector Frank Stephens (1849-1937). In 1910 Kate was appointed curator of the San Diego Natural History Museum, where she and Frank created the museum's first exhibits and built collections providing the foundation of the museum's holdings today. She served as Curator of Mollusks and Marine Invertebrates from 1917 until her retirement in 1936. Kate discovered the holotypes for *Odostomia stephensae* Dall & Bartsch, 1909, and *Cerithiopsis stephensae* Bartsch, 1909, when she and Frank took part in the Alexander Alaska Expedition of 1907 to southeastern Alaska.

Honored in the names *Pusellum bushae* Henderson, 1920, and *Pandora bushiana* Dall, 1886, zoologist and malacologist Katherine Bush (1855-193), was the first woman to graduate from Yale University with a doctorate in science. She published 19 research articles describing 73 new species of mollusks herself and another 97 with Yale University colleague Addison Emery Verrill (1839-1926). Together or separately, she and Verrill authored more than 60 genera or other higher categories of mollusks (Johnson, 1989). In addition to species listed here, the molluscan genera *Bushia* Dall, 1886, and *Bushiella* Knight-Jones, 1973, as well as a dozen or more molluscan species have been named in Bush's honor.

Olive Knowles Hornbrook MacFarland (1872-1962) is remembered in the names *Anteaeolidiella oliviae* (MacFarland, 1966) and *Hermaea oliviae* (MacFarland, 1966). A physiology graduate of Stanford University (B.A., 1906; M.A., 1908), she illustrated many of the scientific papers of her husband, nudibranch expert Frank Mace MacFarland (1869-1951), and found the specimens he named for her. Following Frank's death, she spent the next decade organizing his notes and manuscript material for his comprehensive posthumous "Studies of Opisthobranchiate Mollusks of the Pacific Coast of North America" (1966, *Memoirs of the California Academy of Sciences* 6: 1-546).

Hydrothermal expert and Canada Research Chair in Deep Ocean Research at the University of Victoria, British Columbia, Canada, Verena Tunnicliffe (1953-), is recognized in this study by four species, two with the epithet *tunnicliffae* and another two with the trivial *verenae* (Table 1). Her research of hydrothermal vents and extreme deep ocean habitats has resulted in identification of some 80 new species of mollusks and other marine life. Tunnicliffe is the author or coauthor of more than 130 scientific papers on subjects ranging from the biology of hydrothermal vents and eruptive submarine volcano activity to patterns of glass sponge distribution and the marine biota of British Columbia. She is also the author of a children's book, *Kira's Undersea Garden* (2003), and makes frequent appearances in public media and as a lecturer to promote science.

University of California, Berkeley, Emeritus Professor Carole Jean Stentz Hickman (1942-), an authority on the diversity of structure and functional morphology of living and fossil organisms, is honored in *Choristella hickmanae* McLean, 1992, and *Margarites hickmanae* McLean, 1984. Hickman's more than 100 publications treat a variety of subjects, including the evolution and function of the gastropod radula, repeated patterns of microsculpture on gastropod larval shells, molluscan phylogeny, analysis of form and function in fossils, radular patterns and ecology of deep-sea limpets, and related subjects. She is the author or coauthor of 11 family group names, 9 genera, and 78 species of Recent and fossil mollusks (Carole Jean Stentz Hickman, pers. comm. 15 March 2021).

Names from Abroad

The list of women honored in the names of Pacific coast mollusks is also impressively international in scope.

Three taxon names derive from those of English women whose collecting interests contributed to malacology in very different ways. One of the wealthiest women in England during her lifetime and renowned as a generous patron of the arts and natural sciences, Lady Margaret Cavendish Bentinck, second Duchess of Portland (1715-1785) (Figure 4), is the namesake of the bivalve genus *Portlandia* Mörch, 1857. She employed the naturalist-botanist Daniel Solander (1733-1782), who had accompanied Sir Joseph Banks during Captain James Cook's 1768-1771 first voyage of discovery, to catalogue her very large shell collection. Solander worked for several months on the collection, but his sudden death in 1782 left the work unfinished. When the Duchess died in 1785, the Reverend John Lightfoot (1735-1788) prepared a catalogue for the sale of her books, jewelry, and art, as well as her large shell collection. Lightfoot used his own and Solander's manuscript names for many of the previously undescribed shells included in what is known as the *Portland Catalogue*. The Duchess's vast shell collection ended up being so widely dispersed among several buyers that most of her specimens have been lost. The *Catalogue*, however, contained new names for many then undescribed species, and in that way provided enduring recognition of Solander's contribution to malacology (Dance, 1986).

Born in Canada but living in England after the age of two, Lady Katherine Jean Wigram (née Douglas) (1817-1863), for whom *Katharina* Gray, 1847, is named, was the second daughter of Thomas Douglas, 5th Earl of Selkirk (1771-1820), and Lady Jean Wedderburn-Colville, Countess of Selkirk (1786-1871). An avid collector of shells and other examples of marine life, she sent the first specimens of *K. tunicata* (then known as *Chiton tunicatus* Wood, 1815), presumably from the west coast of North America, to the British Museum's John Edward Gray (1800-1875). Gray later redescribed *C. tunicatus* and placed it in the genus *Katharina* Gray, 1847, which he had named earlier for Lady Katherine. The attractive chiton *Katharina tunicata* (Wood, 1815), or the "black katy," is the only member of its genus.

An additional name from England is a woman identified in British Museum of London records only as "Mrs. W. P. Mauger" or "Mrs. Mauger" and commemorated in *Archierato maugeriae* (Gray in G. B. Sowerby I, 1832). During the 1840s she donated to the Museum several mollusk specimens and

other marine taxa, as well as a lynx specimen from Canada and a species of gerboa from Egypt (Thomas S. White, Senior Curator of Non-Insect Invertebrates at the Natural History Museum of London, pers. comm. 24 January 2022). Her full identity and further ties to malacology have yet to be defined.

Other eponyms representing international figures include *Cuthona divae* (E. R. Marcus, 1961), named for Diva Diniz Corrêa (1918-1993), a leading authority on nemerteans, or ribbon worms (Figure 5). Following the retirement of noted zoologist Ernst Marcus (1893-1968) in 1963, she succeeded him as chair of the Department of Zoology of the Institute of Biosciences at the University of São Paulo, Brazil, a position she held until her own retirement in 1977. Corrêa published 19 papers on nemerteans, describing seven new genera and some 40 new species. She also published on turbellarians, bryozoans, pycnogonids, anthozoans, and corals.

Japanese shell collector Tamiko Oishi, remembered in *Arctomelon tamikoe* (Kosuge, 1970), provided shells from the East and South China Seas to Japanese malacologists including Sadao Kosuge (1933-), Tadashige Habe (1916-2001), Tokubei Kuroda (1886-1987), and others. They in turn named several species of mollusks in her honor. She was coauthor of two still-accepted gastropod species—*Amalda aureocallosa* (Shikama & Oishi, 1977) and *A. parentalis* (Shikama & Oishi, 1977)—with Tokio Shikama (1912-1978). He named *Conus oishii* (Shikama, 1977), *Bolma tamikoana* (Shikama, 1973), and *Perotrochus oishii* (Shikama, 1973) in her honor.

The buccinid species *Retimohnia lussae* Kosyan & Kantor, 2016, is named for Valentina Yanovna Lus (1927-1997). Born in Riga, Latvia, she graduated from the Biological Faculty of Lomonosov Moscow State University in 1952. After later completing her doctorate, Lus joined the laboratory staff at the Shirshov Institute of Oceanology of the USSR Academy of Sciences, where she continued to conduct research and to publish until her death in Moscow in 1997. Lus published several papers, nearly all in Russian, on deep-water gastropods from the north and northwestern Pacific Ocean, including the Kurile-Kamchatka Trench. She was a specialist in the anatomy and taxonomy of abyssal Buccinidae, of which she introduced several new species and five genera (Yuri Kantor, A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences, Moscow, Russia, pers. comm. 14 April 2019).

Female Russian malacologists are honored in the names of several species. Deep-water gastropod expert Zinaida A. Filatova (1905-1984) (Figure 6) is remembered in *Rhinoclama filatovae* (F. R. Bernard, 1979). Since 1948 she was a senior researcher at and later (1970-1979) head of the Benthos Laboratory of Russia's Institute of Oceanology, P. P. Shirshov Academy of Sciences. She took part in many Russian marine scientific expeditions during a time when, especially in Britain and North America, allowing women to serve on board an expedition ship was frowned upon. Her more than 120 publications treated subjects ranging from the distribution of deep-sea bottom fauna and the phylogeny of abyssal and hadal bivalves to mollusks of the northern seas of Russia. In addition to a major revision of the Tardigrada, she developed an important system of zoogeographic zoning of the Arctic seas (Roginskaya, 1984).

Nina Valerianovna Riabinina, for whom *Crassocardia rjabiniinae* (Scarlato, 1955) is named, was born in Murom, Vladimir province, Russia. She was a member of the Department of Hydrobiology at Leningrad University during at least the 1950s. What may have been her only publication on mollusks was titled "Carditacea from Chukotsk Sea and Bering Strait. Extreme Northeast of the USSR (Krajnij Severo-Vostok Sojuza SSR) II Moscow" (1952, *Akademiia Nauk SSSR* 2: 279-285), in which she described *Venericardia* (*Cyclocardia*) *borealis ovata* Riabinina, 1952, now accepted as *Cyclocardia ovata* (Riabinina, 1952). She was the daughter of Valerian Riabinin (1880-1960), an eminent Russian geologist and the brother of Anatoly Riabinin (1874-1942), an equally notable Russian geologist and paleontologist (Konstantin A. Lutaenko, National Center of Marine Biology, Far East Branch of the Russian Academy of Sciences, pers. comm. 28 November 2018).

Tamara Semyonova is honored in the name *Yoldiella tamara* (Gorbunov, 1946). She was a notably skilled scientific assistant aboard the *Sedov*, an icebreaker that became trapped in Arctic ice during its 1937 scientific exploration of northern Russia's Laptev Sea. Ultimately becoming famous as Russia's first drifting scientific ice station, the *Sedov* was eventually freed from the ice by the icebreaker *Joseph Stalin* in January 1940. The scientists and crew of the *Sedov* were greeted as national heroes when they returned home (Anonymous, 1940).

Olga Lvovna Zimina (*Ziminella* Korshunova, Martynov, Bakken, Evertsen, Fletcher, Mudianta, Saito, Lundin, Schrödl & Picton, 2017) is currently a researcher in the Zoobenthos Laboratory at the Murmansk Marine Biological Institute, Murmansk, Russia. In addition to three sponge species, she is coauthor of the nudibranch genus *Zeusia* Korshunova, Zimina & Martynov, 2017, and several mollusk species.

Women from Different Careers

Not all the women commemorated in molluscan eponyms are primarily shell collectors, malacologists, or marine scientists.

Lirobittium johnstonae (Bartsch, 1911) was named for Elizabeth Ellen Johnston (1849-1933), wife of a San Pedro, California, Episcopalian minister. An amateur collector of marine algae and seashells, she was a friend of neighboring conchologist Sarah Maria Baldrige (1837-1917), for whom at Johnston's request Paul Bartsch named *Cyclostremiscus baldridgeae* (Bartsch, 1911) and *Odostomia baldridgeae* Bartsch, 1912 (Table 1). In addition to shells, Johnston collected the type specimens of several species of marine algae, including *Streblonema johnstoniae* Setchell & Gardner and *Scinaia johnstoniae* Setchell, which were also named for her.

Underwater photographer Brook Peterson (1966-) has received numerous awards and other forms of recognition for her photos of undersea marine life and environments. In addition to her photographic work, she maintains an online site providing underwater photography tutorials, a blog and newsletter, and news about the international underwater photography tours she leads. She found the holotype of *Placida brookae* McCarthy, Krug & Valdés, 2019, while diving off the coast of southern California. Invited to choose her discovery's name, Brook selected her first name rather than her last because she

felt the epithet *petersonae* might sound too much like pig Latin (Brook Peterson, pers. comm. 21 November 2019).

The creative talents of Michelle Louise Schwengel-Regala (1971-) (Figure 7), a mixed-media artist specializing in scientific illustration and ocean-themed fiber and metal sculpture, are recognized in *Microglyphis michelleae* Valdés, 2019. Natural history and her personal field work experiences are at the core of Schwengel-Regala's conceptual approaches, which often feature marine environments and species endemic to Hawai'i or Antarctica. She has been an artist in residence at the University of Hawai'i at Mānoa (2015-2016), Artist-at-Sea aboard the Schmidt Ocean Institute's R/V *Falkor* (2016), and a resident artist at the Bishop Museum in Honolulu. During 2017 she carried out SCUBA diving and research while participating in the National Science Foundation's Antarctic Artists and Writers Program.

Crepidula wolfae Collin, 2019, is named for civil rights activist and conservationist Hazel Wolfe (1898-2000). After spending most of her life as an often-controversial social advocate, she served from age 67 until her death as secretary of the Seattle, Washington, chapter of the Audubon Society and founded the Seattle Community Coalition for Environmental Justice to protect poor people and minorities from excessive pollution.

Crepidula huertae Collin, 2019, honors farm-labor leader and civil rights icon Dolores Huerta (1930-) (Figure 8), who organized farm worker strikes with Cesar Chavez and continues today to defend immigrant rights. As the founder in 2002 and still president of the Dolores Huerta Foundation, she continues to work with local and national organizations to address current social and political issues. An indefatigable advocate for minority rights, Huerta has been arrested over 20 times while protesting for various social causes, most recently on August 20, 2019, when at the age of 89 years she was arrested outside the Fresno County Board of Supervisors chambers in Fresno, California, with others as they demanded better salaries for county home care workers (Carroll, 2020).

Family, Friends, and Wives and Husbands

Several epithets in the examined group are named for family members, including wives (*annettae*, *lynnae*, *mariae*, *oliviae*, *porterae*), daughters (*azineae*, *jannae*, *julieae*), and a mother (*hansineensis*). The genus *Olea* Agersborg, 1923, is named for the author's sister. *Dendrodoris azineae* Behrens & Valdés, 2004, was named for then five-year-old Azine Spalding at the request of her father, George Spalding III, who collected the holotype (Behrens and Valdés, 2004). *Tucetona isabellae* Valentich-Scott & Garfinkle, 2011, honors a then two-year-old girl, Isabella Rocha—not a family member but someone coauthor Elizabeth Garfinkle (in 2011 a 16-year-old high school student) babysat and with whom she had a close relationship (Valentich-Scott, 2011).

Wives are significant partners in their spouses' scientific careers, and many have accomplishments independent of their spouse. Wilmatte Porter Cockerell (1869-1957), for example, was married to noted entomologist Theodore Dru Alison Cockerell (1866-1948) (Figure 9). A public-school teacher as well as an astute naturalist, Wilmatte accompanied Theodore on numerous collecting expeditions. She field-collected diverse new and fossil taxa, developed a variety of red sunflower plant, and

published in scientific journals as well as a literary magazine. After Theodore's death in 1948, Wilmatte taught for a time at The Piney Woods School, an historically African-American boarding school near Jackson, Mississippi. She died in Los Angeles, California, in 1957. In addition to *Felimare porterae* (Cockerell, 1901), she is the discoverer and namesake of the leaf-cutter bee *Anthidium porterae* T. D. A. Cockerell, 1900; the crane fly *Teucholabis cockerellae* C. P. Alexander, 1915; the climbing cactus genus *Wilmattea* E.G. Britton & Rose; and a fossil moss, *Glyphomitrium cockerelleae* E.G. Britton & Hollick.

Wives and husbands are honored together in the names of four species in the list of taxa reviewed for this study.

Katherine Anne Limbaugh (later Blackledge) (1924-2016) and her husband Conrad Limbaugh (1924-1960), a leading pioneer at Scripps Institution of Oceanography in the development of scuba diving standards, are named in *Cadlina limbaughorum* Lance, 1962. Katherine Limbaugh assisted her husband's marine biology research and, following his death, coached swimming and taught physical education subjects at junior and senior high schools in Palo Alto, California. Athletic all her life, she competed in local and national age-class swim competitions, winning gold medals into her eighties (Palo, 2016).

Eveline du Bois-Reymond Marcus (1901-1990) and Ernst Marcus (1893-1968), for whom *Coryphellina marcusorum* (Gosliner & Kuzirian, 1990) is named, were known for their distinguished systematic work on opisthobranchs (now = Euopisthobranchia and Panpulmonata), Bryozoa, and various invertebrate taxa. She made most of the drawings for Ernst's publications and contributed richly illustrated paintings for *Tiergeographie* (1933), his important work on animal geography. Separately and as coauthors, the Marcuses published an enormous number of highly detailed studies, describing 222 new species in an impressive range of marine invertebrates. They coauthored *American Opisthobranch Mollusks* in 1967 and overall described 22 new opisthobranch genera (Winston, 2002).

Petricola hertzana Coan, 1997, was named for Carole M. Hertz (1932-) and her husband Jules Hertz (1929-2018) (Figure 10), for over four decades the inspirational leaders of the San Diego Shell Club in San Diego, California. Carole Hertz served from 1970-2014 as editor of the Club's journal *The Festivus* and is the author of *Illustrations of the Types Named by S. Stillman Berry in his "Leaflets in Malacology"* (1999). In addition to their numerous journal publications related to conchology and malacology, she and Jules described *Niso attillio* (C. M. Hertz & J. Hertz, 1987). Carole is also coauthor of the subfamily *Tripterotyphinae* D'Attilio & Hertz, 1988, and eight other molluscan species.

Calyptogena packardana Barry, Kochevar, Baxter & Harrod, 1997, honors Hewlett-Packard Company co-founder David Packard (1912-1996) and his wife Lucille Salter Packard (1914-1987). In addition to establishing the David and Lucille Packard Foundation, which provides primary funding for the Monterey Bay Aquarium, the couple founded the Monterey Bay Aquarium Research Institute (MBARI) and the Lucille Packard Children's Hospital at Stanford University.

Other Eponymous Names

Additional female malacologists, marine scientists, conchologists, and others for whom genera and species treated in this study are named are too numerous to describe here but should be recognized. Among malacologists and marine scientists, these names include Bertha M. Challis (1886-1957), Nora Foster (1947-), Leslie Harris (1948-), Olga Hartman (1900-1974), Jennifer B. McCarthy, Sabrina Medano (1986-), Ruth Dixon Turner (1914-2000), and Cindy Lee Van Dover (1954-). As with others who have been discussed earlier, many of these individuals are also honored in the scientific names of taxa occurring outside the geographical scope of this study.

Further female conchologists for whom this study's taxa are named include the following individuals, several of whom have contributed significant publications on new molluscan species and other malacological subjects: Maria Baldrige (1837-1917), Constance E. Boone (1917-1999), Mary Adelaide Bormann (1898-1961), Laura E. Cantrell Burghardt (1933-), Thelma Crow (1907- ?), Helen DuShane (1907-2002), Nannie M. Eshnaur (1862-1943), Nettie Wallace Fackenthal (1868-1943), Lydia Emerson Fancher (1825-1907), Kirstie L. Kaiser (1949-), Rhonda Mont (1960-), Lillian J. Sawin (1848-1934), Rubie E. Sharon (1894-1962), Carrie L. Simons, and Carol Christine Skoglund (1924-2015). As with the malacologists and marine scientists named above, specific taxa honoring each of these individuals can be found by perusing Table 1 for terms incorporating their first or last names.

The focus of this paper is on the eponymous names of marine molluscan genera and species found from Alaska to Islas Cedros, Baja California. A compilation of eponyms occurring among species within another geographical range would undoubtedly present additional and different characteristics than those described here. The 91 eponymous female names for molluscan taxa listed in Table 1 represent an impressive range of inspiring women. Their unique identities, contributions, and influence within the ongoing history of malacology merit greater notice and study.

ACKNOWLEDGEMENTS

This paper was prompted by a presentation during an online meeting (5 February 2022) of the Southern California United Malacologists (SCUM) by Jann Vendetti of the Natural History Museum of Los Angeles County. Titled "Scientific Names in Southern Californian Mollusks: An Abbreviated Tour of History, Legacy, and Representation," the presentation discussed eponymous names in malacology and the need for greater recognition through such names of female contributions to science. Vendetti's remarks and those of other meeting participants underscored the need for greater awareness of female eponyms in malacology.

I appreciate the careful review and thoroughly helpful advice of Hans Bertsch as well as comments and the photograph of Carole and Jules Hertz from Paul Valentich-Scott. I thank José Leal of *The Nautilus* for permission to use the photograph of Ida S. Oldroyd and Tom Shaw Oldroyd, as well as Michelle Louise Schwengel-Regala for the use of her photograph. Much of the research for this paper was conducted with the helpful assistance of staff in the Department of Invertebrate Zoology at the Santa Barbara Museum of Natural History.

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Eponym	Taxon	Eponym	Taxon
<i>annettae</i>	<i>Lophocardium annettae</i> (Dall, 1889)	<i>Keenocardium</i>	<i>Keenocardium</i> Kafanov, 1974
<i>azineae</i>	<i>Dendrodoris azineae</i> Behrens & Valdés, 2004	<i>lamonae</i>	<i>Neverita lamonae</i> Marinovich, 1975
<i>baldridgeae</i>	<i>Odostomia baldridgeae</i> Bartsch, 1912	<i>laurae</i>	<i>Placiphorella laurae</i> Clark, 2019
<i>boonea</i>	<i>Boonea</i> Robertson, 1978	<i>limbaughorum*</i>	<i>Cadlina limbaughorum</i> Lance, 1962
<i>bormannae</i>	<i>Paciocinebrina bormannae</i> Wiedrick & Houart, 2020	<i>lussae</i>	<i>Retimohnia lussae</i> Kosyan & Kantor, 2016
<i>brightae</i>	<i>Melanodrymia brightae</i> Warén & Bouchet, 1993	<i>lynnae</i>	<i>Adontorhina lynnae</i> Valentich-Scott, 2000
<i>brookae</i>	<i>Placida brookae</i> McCarthy, Krug & Valdés, 2019	<i>marcusorum*</i>	<i>Coryphellina marcusorum</i> (Gosliner & Kuzirian, 1990)
<i>bushae</i>	<i>Pusellum bushae</i> (Henderson, 1920)	<i>mariae</i>	<i>Lirophora mariae</i> (d’Orbigny, 1846)
<i>bushiana</i>	<i>Pandora bushiana</i> Dall, 1886	<i>maugeriae</i>	<i>Archierato maugeriae</i> (Gray in G.B. Sowerby I, 1832)
<i>carolae</i>	<i>Neoterebra carolae</i> (Bratcher, 1979)	<i>michelleae</i>	<i>Microglyphis michelleae</i> Valdés, 2019
<i>challisiana</i>	<i>Thracia challisiana</i> Dall, 1915	<i>myrae</i>	<i>Ensis myrae</i> S. S. Berry, 1953
<i>cookeana</i>	<i>Macrarene cookeana</i> (Dall, 1918)	<i>myrakeenae</i>	<i>Tritoncula myrakeenae</i> (Bertsch & Mozeira, 1986)
<i>cookeana</i>	<i>Odostomia cookeana</i> Bartsch, 1910	<i>norafosterae</i>	<i>Scabrotrophon norafosterae</i> Houart, Vermeij & Wiedrick, 2019
<i>cookeana</i>	<i>Turbonilla cookeana</i> Bartsch, 1912	<i>oldroydae</i>	<i>Alvania oldroydae</i> Bartsch, 1911
<i>cookeanum</i>	<i>Epitonium cookeanum</i> Dall, 1917	<i>oldroydae</i>	<i>Lirobittium oldroydae</i> (Bartsch, 1911)
<i>divae</i>	<i>Cuthona divae</i> (Er. Marcus, 1961)	<i>oldroydae</i>	<i>Melanella oldroydae</i> Bartsch, 1917
<i>dushaneae</i>	<i>Claviscala dushaneae</i> L.G. Brown, 2019	<i>Olea</i>	<i>Olea Agersborg</i> , 1923
<i>eshnaurae</i>	<i>Vitrinella eshnaurae</i> Bartsch, 1907	<i>oliviae</i>	<i>Anteaeolidiella oliviae</i> (MacFarland, 1966)
<i>fackenthallae</i>	<i>Turbonilla fackenthallae</i> A.G. Smith & Gordon, 1948	<i>oliviae</i>	<i>Hermaea oliviae</i> (MacFarland, 1966)
<i>fancherae</i>	<i>Ophiodermella fancherae</i> (Dall, 1903)	<i>packardana*</i>	<i>Calyptogena packardana</i> Barry, Kochevar, Baxter & Harrold, 1997
<i>filatovae</i>	<i>Rhinoclama filatovae</i> (F.R. Bernard, 1979)	<i>porterae</i>	<i>Felimare porterae</i> (Cockerell, 1901)
<i>hansineensis</i>	<i>Olea hansineensis</i> Agersborg, 1923	<i>Portlandia</i>	<i>Portlandia Mörch</i> , 1857
<i>harrisae</i>	<i>Philine harrisae</i> Valdés, Cadien & Gosliner, 2016	<i>rhondae</i>	<i>Archierato rhondae</i> Fehse & Simone, 2020
<i>hartmanae</i>	<i>Falcidens hartmanae</i> (Schwabl, 1961)	<i>rjabininae</i>	<i>Crassocardia rjabininae</i> (Scarlato, 1955)
<i>helga</i>	<i>Odostomia helga</i> Dall & Bartsch, 1909	<i>sabriniae</i>	<i>Microglyphis sabriniae</i> Valdés, 2019
<i>hertzana*</i>	<i>Petricola hertzana</i> Coan, 1997	<i>sawinae</i>	<i>Epitonium sawinae</i> (Dall, 1903)
<i>hickmanae</i>	<i>Choristella hickmanae</i> J.H. McLean, 1992	<i>sharonae</i>	<i>Hainotis sharonae</i> (Willett, 1939)
<i>hickmanae</i>	<i>Margarites hickmanae</i> J.H. McLean, 1992	<i>shepardiana</i>	<i>Odostomia stephensae</i> Dall & Bartsch, 1909
<i>huertae</i>	<i>Crepidula huertae</i> Collin, 2019	<i>simonsae</i>	<i>Arctomelon tamikoae</i> (Kosuge, 1970)
<i>idae</i>	<i>Altimitra idae</i> (Melvill, 1893)	<i>steinbergae</i>	<i>Corambe steinbergae</i> (Lance, 1962)
<i>idae</i>	<i>Idatellina idae</i> (Dall, 1891)	<i>stephensae</i>	<i>Cerithiopsis stephansae</i> Bartsch, 1909
<i>Idatellina</i>	<i>Idatellina</i> M. Huber, Langleit & Kreipl, 2015	<i>stephensae</i>	<i>Odostomia stephensae</i> Dall & Vartsch, 1909
<i>isabellae</i>	<i>Tucetona isabellae</i> Valentich-Scott & Garfinkle, 2011	<i>tamara</i>	<i>Yoldiella tamara</i> (Gorbunov, 1946)
<i>janetae</i>	<i>Anatoma janetae</i> Geiger, 2006	<i>tamikoae</i>	<i>Arctomelon tamikoae</i> (Kosuge, 1970)
<i>jannae</i>	<i>Knoutsodonta jannae</i> (Millen, 1987)	<i>thelmacrowae</i>	<i>Paciocinebrina thelmacrowae</i> Houart, Vermeij & Wiedrick, 2019
<i>jeannettae</i>	<i>Alaba jeannettae</i> Bartsch, 1910	<i>tunnicliffae</i>	<i>Paralepetopsis tunnicliffae</i> J.H. McLean, 2008
<i>jennyae</i>	<i>Bogasonia jennyae</i> Valdés, 2019	<i>tunnicliffae</i>	<i>Sutilizona tunnicliffe</i> Warén & Bouchet, 2001
<i>johnstonae</i>	<i>Lirobittium johnstonae</i> (Bartsch, 1911)	<i>turnerae</i>	<i>Penitella turnerae</i> Evans & Fisher, 1966
<i>julieae</i>	<i>Akera julieae</i> Valdés & Barwick, 2005	<i>vandoverae</i>	<i>Caymanabyssia vandoverae</i> J. H. McLean, 1991
<i>kaiserae</i>	<i>Scissurella kaiserae</i> Geiger, 2006	<i>verenae</i>	<i>Admette verenae</i> Harasewych & Petit, 2011
<i>Katharina</i>	<i>Katharina</i> Gray, 1847	<i>verenae</i>	<i>Cornisepta verenae</i> J.H. McLean & Geiger, 1988
<i>keanae</i>	<i>Calliostoma keanae</i> J.H. McLean, 1970	<i>vokesae</i>	<i>Pteropurpura vokesae</i> Emerson, 1964
<i>keanae</i>	<i>Glycymeris keanae</i> Willett, 1944	<i>williamsoni</i>	<i>Vitrinella williamsoni</i> Dall, 1892
<i>keanae</i>	<i>Littorina keanae</i> Rosewater, 1978	<i>wolfae</i>	<i>Crepidula wolfae</i> Collin, 2019
<i>keanae</i>	<i>Rissoina keanae</i> A.G. Smith & Gordon, 1948	<i>Ziminella</i>	<i>Ziminella</i> Korshunova, Martynov, Bakken, Evertsen, Fletcher, Mudianta, Saito, Lundin, Schrödl & Picton, 2017
<i>Keanaea</i>	<i>Keanaea</i> Habe, 1951		

Table 1. Female Eponyms of Molluscan Genera and Species Names, Alaska to Baja California.

* = species named for wife and husband

Figures and Explanations

Figure 1. A. Myra Keen. Taken by Jim McLean, 1993. Courtesy of Hans Bertsch.

Figure 2. Ida S. Oldroyd and Tom Shaw Oldroyd. Photo with permission of José Leal, The Nautilus.

Figure 3. Kate Stephens. Ginger Dethloff, *The Festivus* 2009. 32(9):127.

Figure 4. The Duchess of Portland. From Wikipedia.

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Figure 9. Wilmatte and T.D.A. Cockerell. From Smithsonian Institution

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Figure 10. Carole and Jules Hertz. Photo courtesy of Paul Valentich-Scott.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9

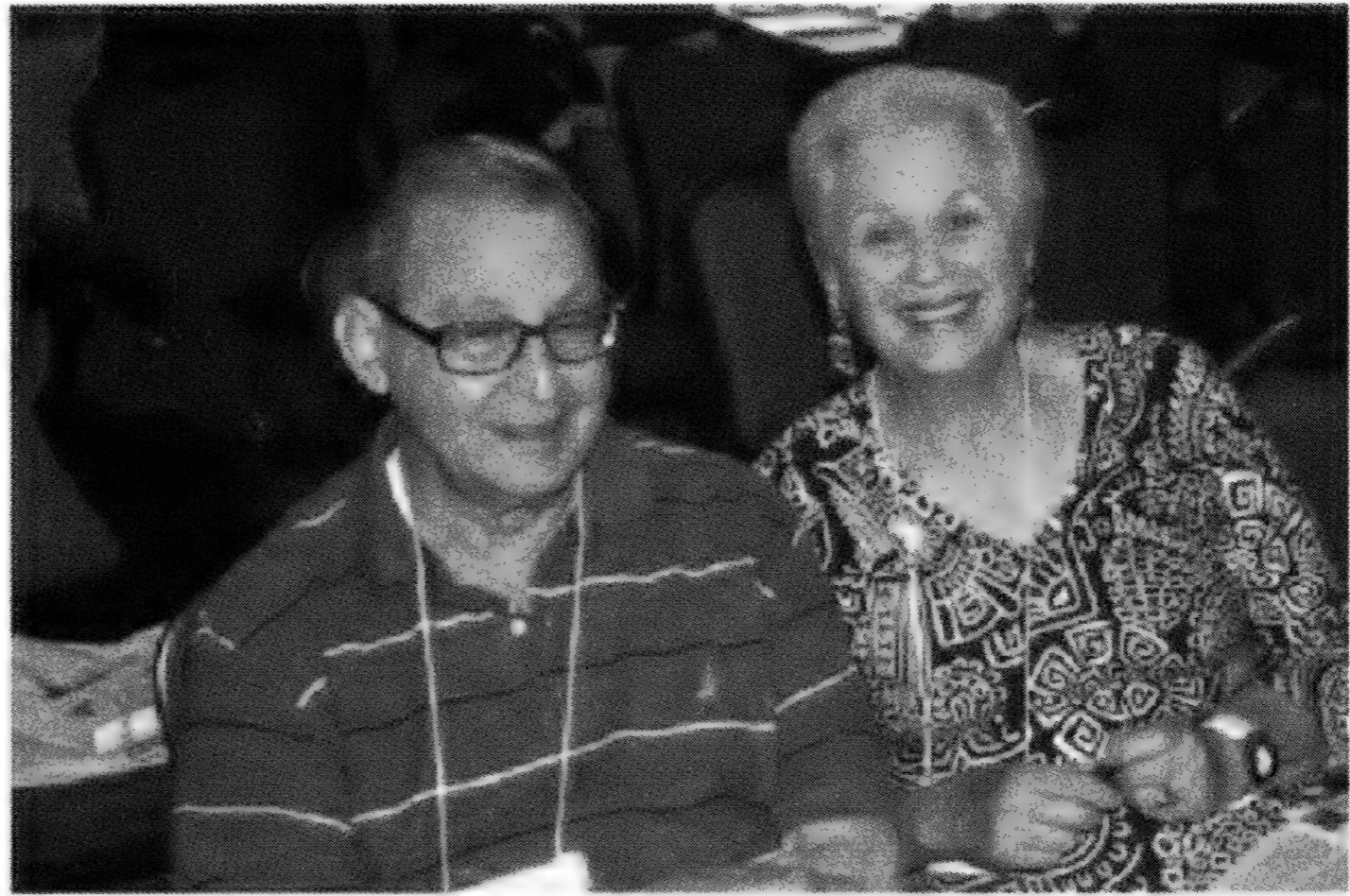


Figure 10

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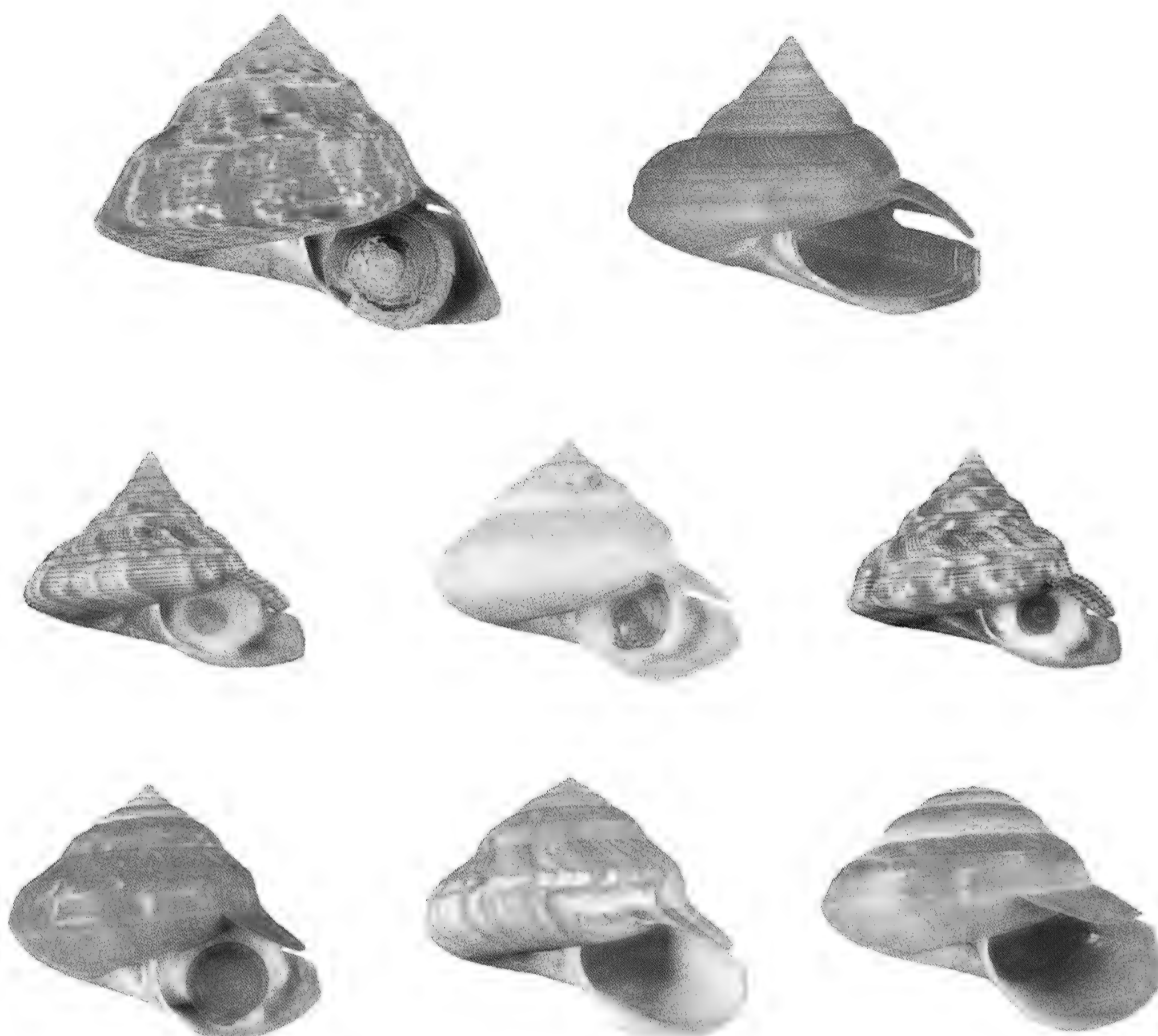
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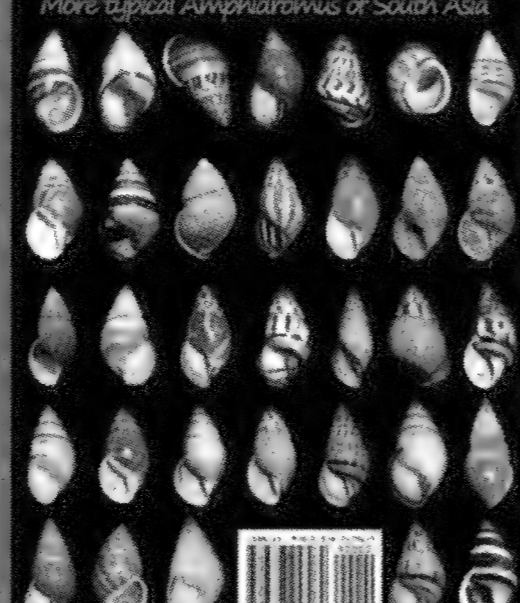


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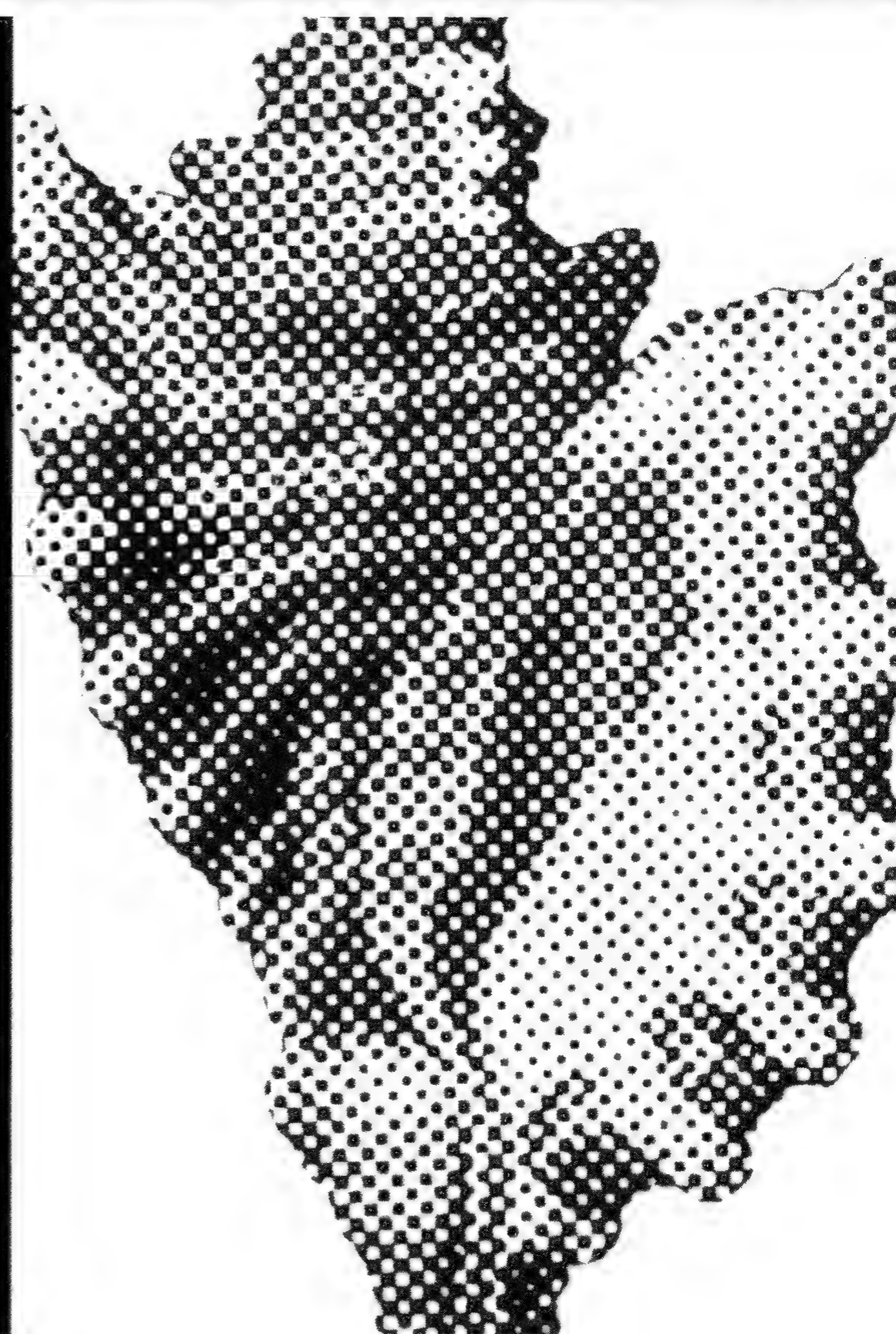
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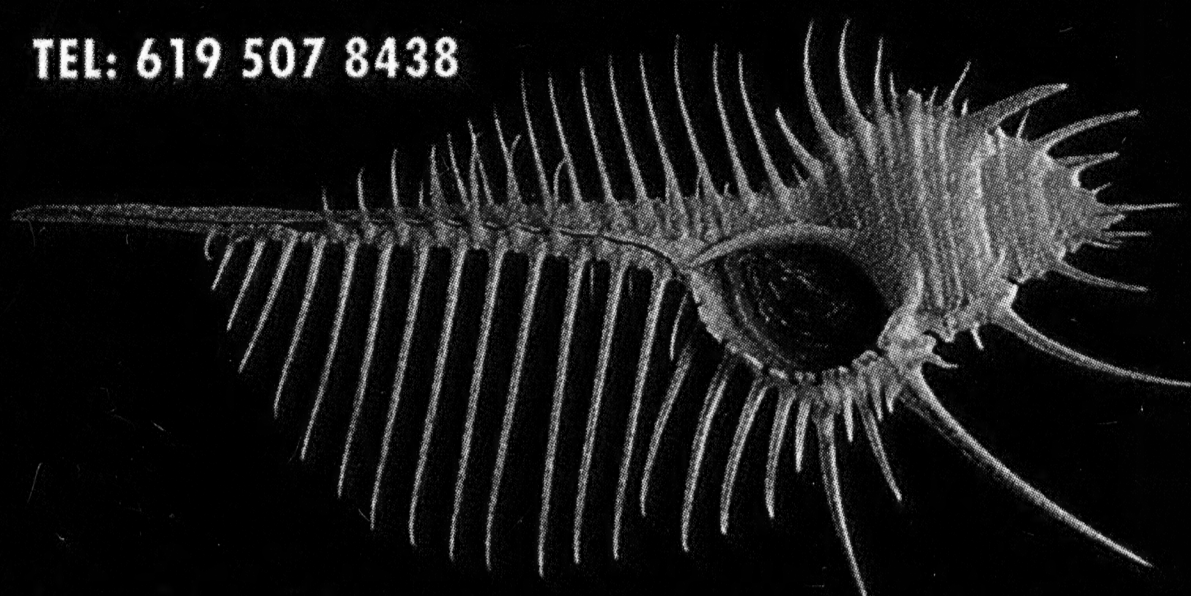
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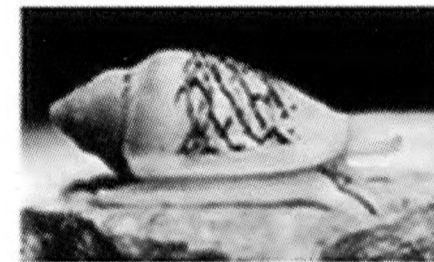
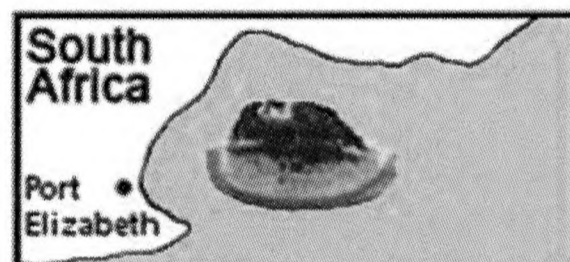
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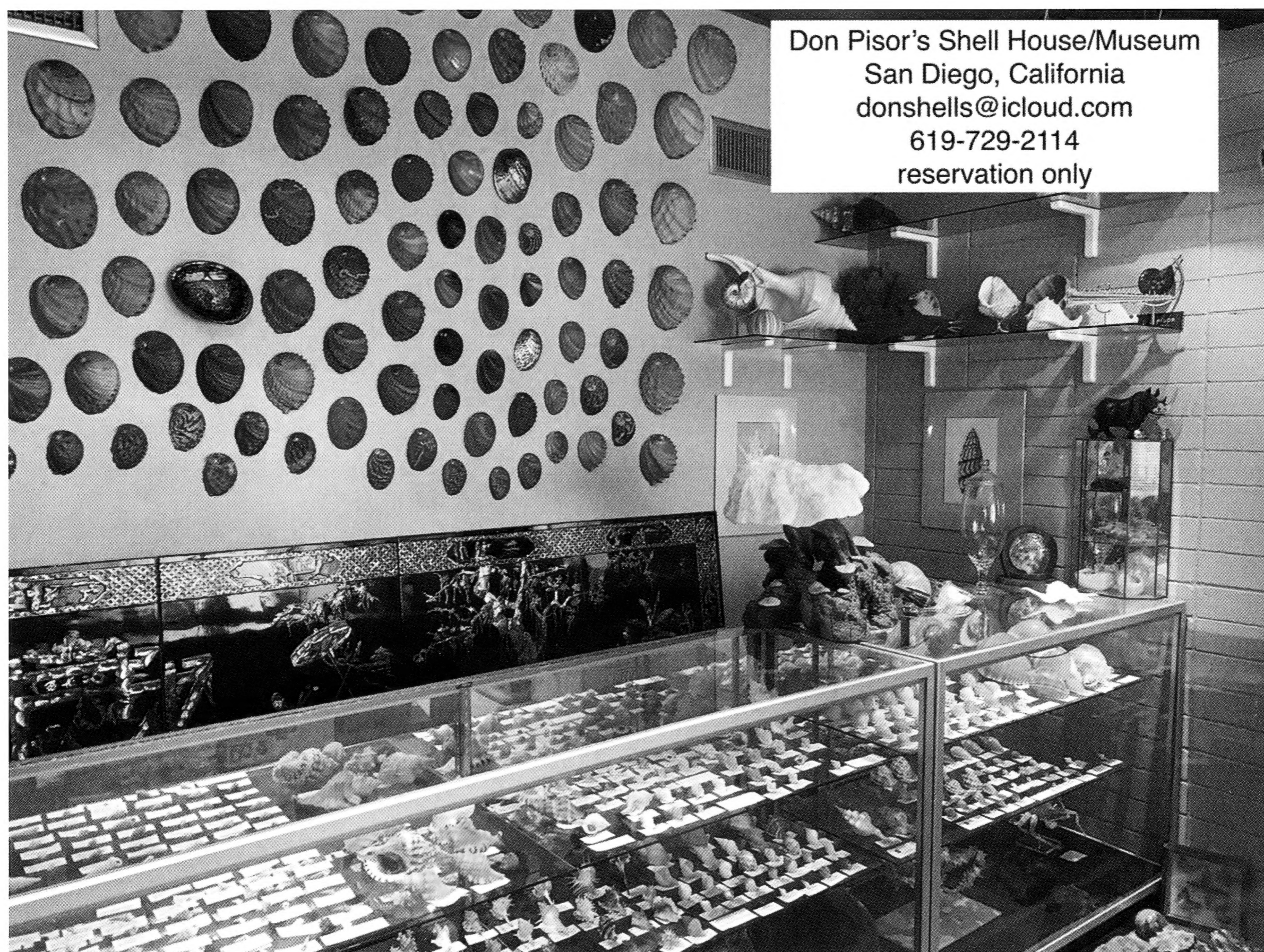
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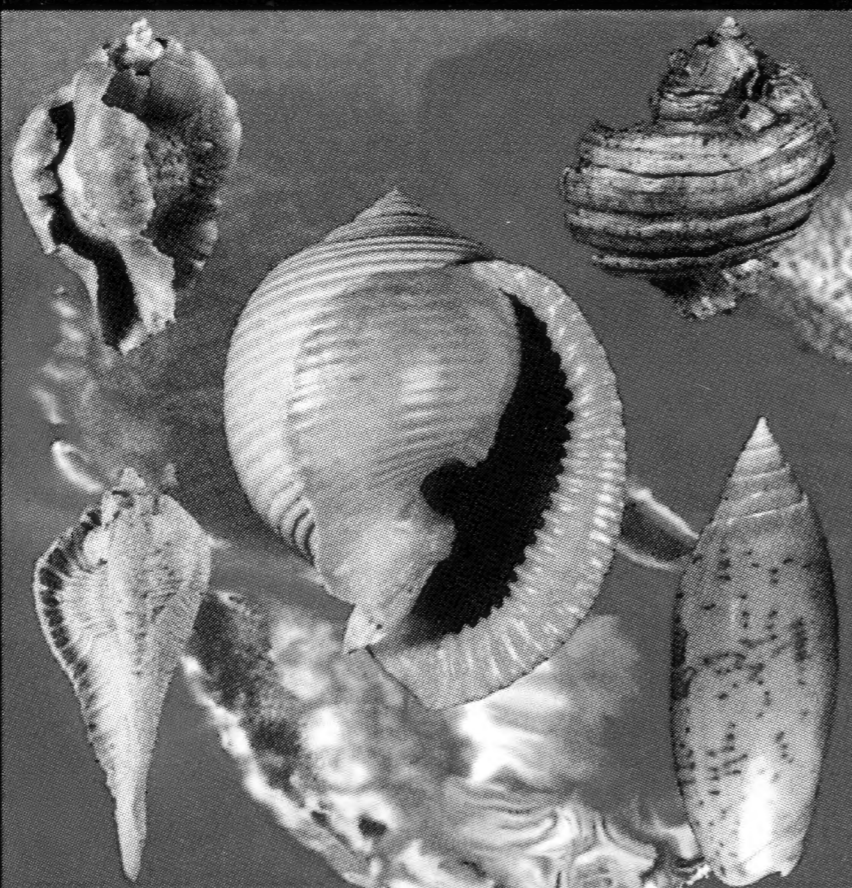
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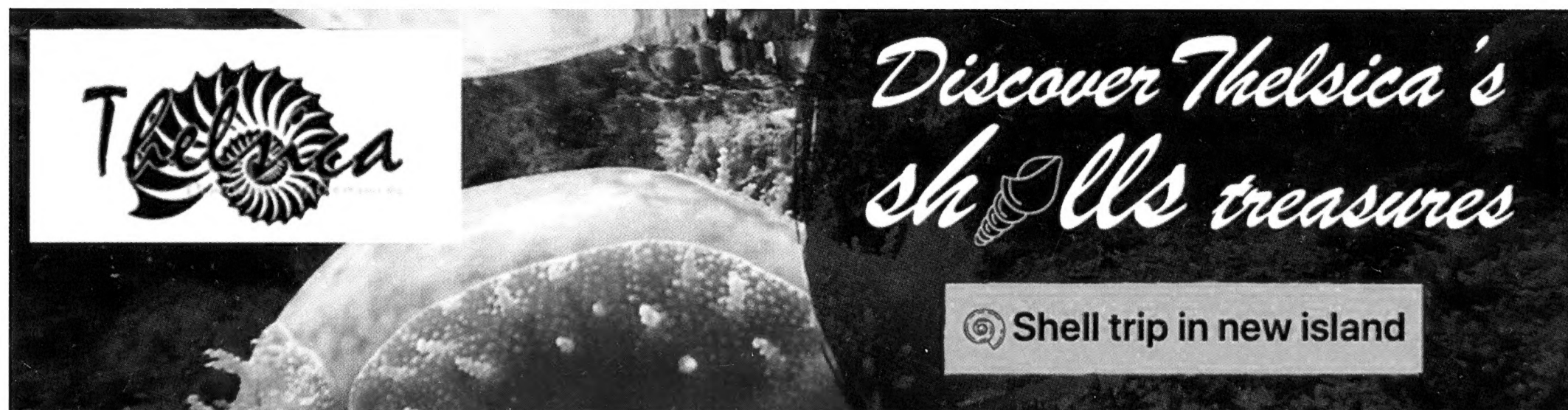
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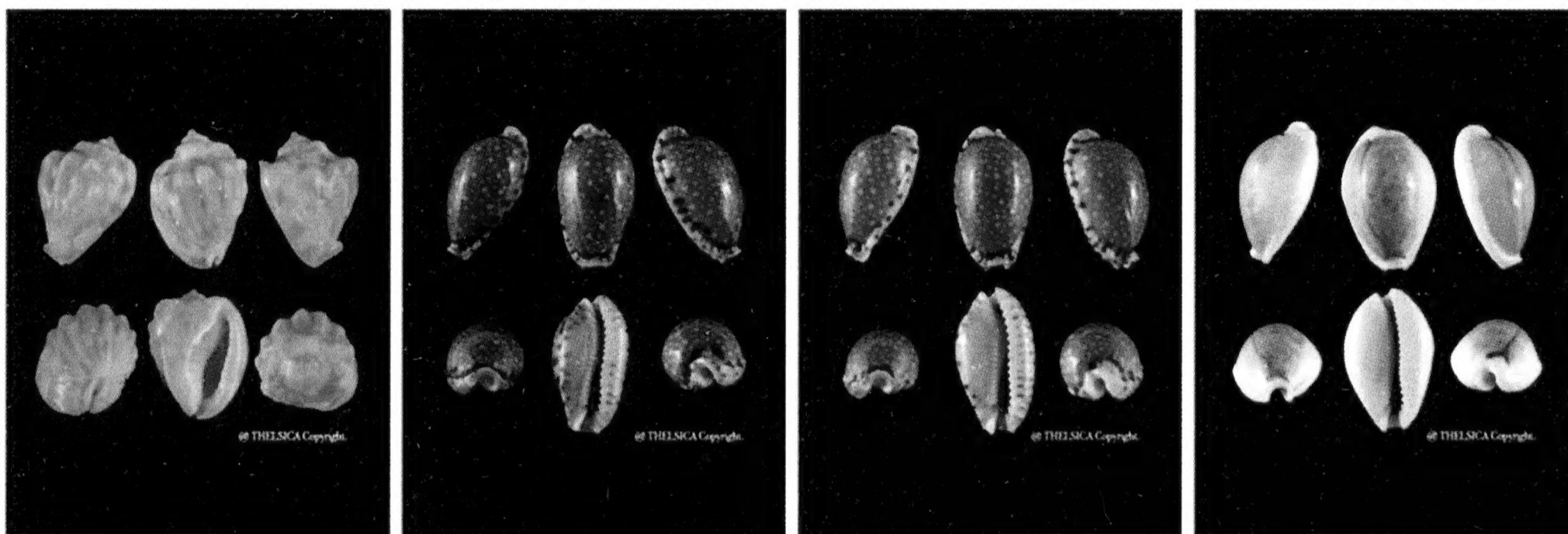
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